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VOL. XI. NEW YORK, APRIL 21, 1888. No. 16.

A Bird's-Eye View of New England. OUR issue this week will be found to consist largely of matter relative to New England, giving a "bird's-eye view" of what is being done there in electrical industries. The various articles, notes and items are of unusual interest. Thanks to the efforts of the vigilant and energetic New England representative of the paper, our readers learn week by week of what is being done in that section of the country; and now his fuller contributions to-day, supplemented by news from many friends and correspondents, present a cheering and hopeful idea of the general activity prevalent.

Formulas for Wiring. To those interested in the wiring of buildings for incandescent electric lighting, the diagram published on another page will be of interest. It is well, however, to point out that it is to be applied only under certain fixed conditions, which are those referring to the quality of the lamp and the percentage of loss allowed. It is evident that for any other lamp, or any other loss, the table would not hold true; therefore, while it is of value in itself, it must be used only in its limited bearing. The objection which might exist as to publishing a diagram of this sort lies in the fact that those who are ignorant of the laws upon which it is based assume that it applies generally; hence we have thought it well to point out here the fact, so that there can be no room for error in regard to its application.

Thermo Electric Batteries. IF we are to believe the claims that are made for the thermo-cell described in another column, effects have there been obtained which are worthy of attention. It is evident that the improved action is due almost entirely to the method adopted for maintaining as great a difference of temperature as possible between the respective ends of the thermo-electric couples. In the present instance, as in most forms heretofore designed, the air alone is employed as the cooling medium. It seems probable that the differences of temperature might be still further increased by the employment of water as the cooling medium, as in the method employed by Mr. E. G. Acheson, described by us some time ago. While the thermo-cell from its very nature cannot be expected to yield a very high efficiency, it occupies even to-day a position of usefulness, and any work applied to increasing its value is important, not only from a scientific, but also from a practical commercial standpoint.

Electric Haulage in Factories. AS the success of electric street railways, which often involve many serious difficulties, is now recognized, electric haulage is looked upon with more and more favor by those interested in the transportation of materials. It required time to bring the owners of street railways to admit the benefits of this mode of propulsion, and mine owners are now about becoming interested in a similar way. But that another large field is still open for development, is made evident by the recent installation of an electric car in a cotton mill, illustrated on another page. In this instance the electric motor accomplishes that which would probably not have been attempted with any other form of motor. It is evident that the question was not only one of compactness combined with power, but also that of safety and cleanliness, the latter quality especially being of considerable importance. It is not difficult to foresee that such work will become quite common in the future, and that the electric locomotive will be as familiar a sight within factories as upon the street.

Insurance Rules and Regulations. We record this week the final proceedings in the organization of the New England Electric Exchange, whose programme has already been given in our columns. It is a pleasure to see the Exchange so well started on a career of usefulness, and we trust that its aims and efforts will be duly appreciated. The officers are an able set of men and thoroughly competent to give direction to the course which the Exchange should pursue. It will be remembered that the movement originated in the recent adoption by the New England Insurance Exchange of rules and regulations for electric light installations, and we have therefore deemed it fitting to give those rules in their entirety, in this, our New England number. The vindication of much that may seem severe and over-strict in these rules is found in the reduction that the Exchange makes in its insurance rates where electric light is used. Such a reduction should be extended in all parts of the country; but as we said last week, there must be the same high standard of precaution and excellence everywhere. The only point that is criticised in the rules is that as to the location of converters.

American Theatre Lighting. GREAT improvements have been made of late years in the lighting of theatres by electricity, and so perfect has the work become, when in good hands, that there is now no reason why the adoption of electricity should not be required for every public building in which large numbers of people assemble. In fact, so impressed are European authorities with the desirability of the electric light, that they have been even precipitate and inconsiderate in forcing it upon theatre managers. However, while in America the use of the light is still permissive and not obligatory by law, many managers are adopting it for their theatres. Thus we are able to illustrate this week a fine theatre plant, which has already been duplicated, and which for flexibility and convenience it seems hard to surpass. Those who have witnessed performances in either of the theatres where these plants are running will readily bear witness to the beauty of the light and effects, and the readiness with which the various changes and combinations are controlled.

Safeguards from Electric Shock. IN another column Mr. P. B. Delany as the inventor of a safeguard against electric shocks from high tension currents, takes certain exception to some of the remarks which we made in reference to the apparatus invented by him, and gives his reasons for differing from us in reference to the value of the device. The arguments advanced, undoubtedly deserve due consideration and are strong, but we believe that actual experiments in this direction alone can finally settle the question thus raised. Evidently one of the important points in connection with the conductivity of the skin is its condition as regards moisture, and a difference in its resistance, under these varying conditions, must to a great extent affect the results. Thus we would have the apparatus dependent on the relative degree of moisture existing between the palm of the hand and the wrist. The question is a decidedly interesting one, and as our able correspondent remarks, it is well worthy of investigation, so that the true value of the device may be established. It will be readily understood that from the knowledge already gained of the variability in the resistance of the human body, the experiments would have to be made on a large number of subjects in order to obtain general results. The current which would be employed for that purpose need not necessarily exceed those ordinarily employed in electro-medical practice, as quite general deductions, it appears, could be made in this way.

Life of Incandescent Lamps. ONE of the most interesting points in connection with Mr. J. W. Howell's paper, read last week before the the American Institute of Electrical Engineers, and which was specially dwelt upon in the discussion, is the curve which represents the variation in the life of lamps burnt at different efficiencies. Thus it will be seen that at a low efficiency between 4½ and 5 watts the life of a lamp is prolonged up to 16,000 hours or more, while at the higher efficiencies the life of a lamp decreases in a very rapid ratio. As was pointed out, this curve represents the qualities of the Edison bamboo, untreated filament, and would probably not hold true for the treated filament. It would, therefore, be interesting to compare the lives of these two filaments, so as to get their relative value. Now that authentic figures on the untreated are at hand, those on the other form might be made public if they exist. It goes without saying that the expense of obtaining such a curve must be very great, and that the conditions of uniformity must be watched with great care, otherwise all results will be misleading.

Electric Science in America. THERE can be no doubt that there is an enormous amount of experimental work performed in the laboratories of the electricians of this country, the results of which, for obvious reasons, have not been made public. But as time passes, the reasons which have dictated the withholding from publicity of this information no longer obtain, and nothing less than duty would dictate making these results known, if they have not been made so before. We are glad, therefore, to note one step in the right direction in the paper read before the American Institute of Electrical Engineers, by Mr. J. W. Howell, which contains information of undoubted value and importance to every one connected with the science and industry of incandescent electric lighting. It must be apparent that the publication of such results must eventually be far more beneficial than the temporary individual gain which might be secured by its being withheld altogether. We hope that the beginning made in the present instance will be followed by similar publications drawn from experience, and we feel safe in asserting that if all the original researches performed in American electrical laboratories were published they could compare favorably with those of any other country in the world, and serve to remove the stigma which is often put upon us abroad to the effect that we always sacrifice science to practice.

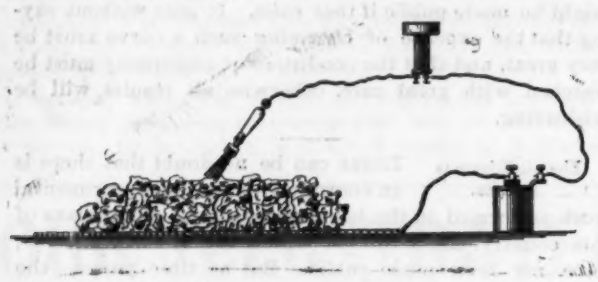
How to Use the Telephone. THE use of the telephone is still with many an unacquired art, though not for want of practice, and there is no doubt that much of the grumbling and complaint comes from those who cannot be taught how to handle the instrument properly. We know of offices where the use of the telephone by certain individuals is always attended by excruciating mirth on the part of every spectator, and of others where persons who should use the telephone very frequently themselves, will not do so, through some queer nervousness, and hence their messages, sent and answered at second hand, are the cause of much confusion and delay. Our philosophic and plainspeaking contemporary, the *Railroad Gazette*, had an excellent article last week on the telephone in freight offices, and made some good points in dealing with the subject. The following we cannot refrain from quoting: "The fundamental difficulty is found perhaps in the old railroad custom of employing cheap help, and of all the cheap help in a freight office the duty of answering the telephone is doubtless generally assigned to the cheapest. The art of communication by telephone is somewhat like telegraphing train orders, an important part being the getting of a response which shall give positive assurance that the original communication has been correctly received. A good cross-questioning lawyer could doubtless give rates through a telephone in such a way as to lure the fellow at the other end into talking back a satisfactory repetition in the way of acknowledgment, but a five dollar office boy has not had enough experience in life to do this. The trouble with stipulations in tariffs or bills of lading or written agreements to be filed away, is that, like an old pine pail, when they are wanted in subsequent months or years they will not hold water; or at least the rights they are intended to protect will have to be fought for in the courts. Poor Richard's maxim about going instead of sending, when one wishes his business to be satisfactorily attended to, is as good now as ever; and as long as we act on the assumption that we must delegate duties, the simplest rule is to find the best person possible to delegate them to. There being no reasonable escape from the telephone, set a careful and experienced clerk to attend to it." There is pith and wisdom in this, but the telephone superintendent has long since ceased to hope that all his subscribers will learn how to use the telephone properly, saving other people's time, preserving their own reputation for sweetness of temper, and allowing the telephone to be taken for what it is, one of the greatest boons of the age.

An Electric Ore Tester.

Among the recent issues of the Patent Office we notice an apparatus which is illustrated in the accompanying engraving. The picture almost explains itself. The apparatus, as will be seen, is designed to test for the presence of ore in a rocky mass, for which purpose the electric current is applied in connection with a telephone, and a brush, which, passing over the metal contained in the ore, is supposed to give a click in the telephone at every contact with a metallic particle. We leave our readers to determine the extent to which this device fulfills the object for which it is intended.

A New Thermo-Electric Battery.

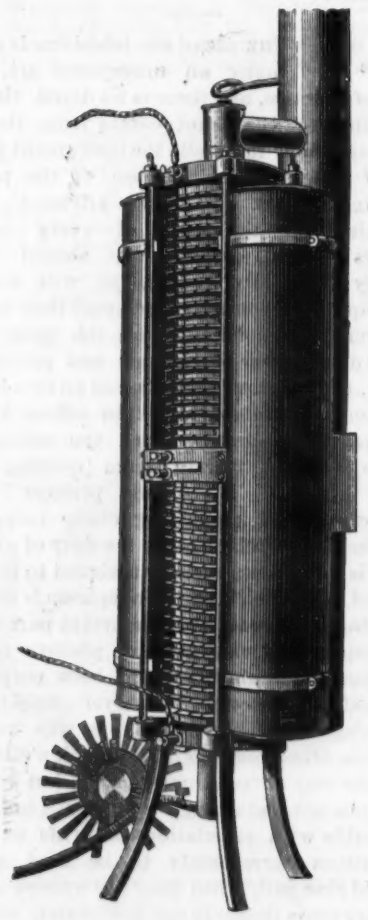
An essential advance in the sphere of thermo-electric batteries, according to the London *Electrical Review*, has recently been made by Dr. E. Raub, of Berlin, Germany. The new battery, which it is claimed removes many of



AN ELECTRIC ORE TESTER.

the defects of the older forms, is shown in the accompanying illustration. The battery consists of two main portions: 1, the annular elements and the heating channel which they form; and 2, the refrigerator, which is applied separately. The circle shown in the figure behind the tripod represents a single element; the positive electrode is formed by a ring of an alloy cast around a copper heating ring, thus effecting a very durable and intimate metallic connection. Externally it is inclosed in a second ring of copper, with refrigerating projections arranged radially. The negative metal is soldered to the heating ring in thin plates and in such a manner that during working, local currents at the points of contact are entirely avoided. After the elements have been built up, the negative metal of each is soldered to the refrigerating projections of the following element.

A number of similar thermo-elements, of any desired size, are insulated from each other by means of a fire-



A NEW THERMO-ELECTRIC BATTERY.

proof material and pressed together between two cast-iron plates in such a manner that the several rings are superimposed concentrically, forming in this manner a firm, safe hollow cylinder, which serves as the heating chamber. The heating is effected by means of any convenient source. For smaller apparatus like that shown in the figure a ring-shaped Bunsen gas-burner is sufficient. For larger batteries a coal or coke fire is required. The flame of the Bunsen burner, screwed on to the lower end of the heating cylinder, comes in intimate contact with the heating rings of all the elements, and takes up its supply of oxygen within the conical flame. The heat is distributed equally to the elements by means of a slender cone fixed to the cover of the heating chamber and projecting into it. It then passes through a transverse channel into a wide stove-pipe, closed below and screwed into the supporting tripod and connected with a chimney having a good draught. The hot air ascending in the chimney draws fresh air into air pipes fixed below the point where the heating chamber vents into the main pipe, so that the external points of contact of the annular elements are kept cool by the draught. A valve is introduced for the regulation of the latter.

Great economy in working is said to be effected by the application of annular thermo-elements in combination with this forcible introduction of air, which admits of the greatest possible utilization of the heat and the production of the greatest possible differences of temperature. Collateral advantages are rapidity and ease in starting work and a minimum requirement of space, since batteries to be heated by gas may be mounted upon a bracket. As valuable features must be mentioned the durability and firmness of the separate elements, as also the possibility of removing damaged rings either for repairs or for the substitution of new ones which may be procured singly from the makers.

The three smallest models to be heated with gas and suitable for the electrolytic production of metals, for electro-plating, etc., consume hourly 300, 500 and 900 litres of gas (or about 11, 18 and 30 cubic feet) having strengths of current of 10, 20 and 40 ampères with an electromotive force of 3 volts. For an hourly consumption of 1 cubic metre these batteries give a useful effect of 80 volt-ampères, whilst those of former constructions yielded at most 27.

Meeting of The New England Electric Exchange.

This newly organized body held its second meeting on the afternoon of April 9, at the rooms of the Boston Electric Club. Between thirty and forty members were present. The secretary, Mr. H. B. Cram, submitted a report from the committee appointed at the meeting held March 22, at which the Exchange was formed. The report embodied a constitution, which was adopted by the meeting, and a plan (also adopted) for issuing licenses to persons engaged in installing and operating electric light plants, in order to promote ambition in excellence of workmanship and extent of knowledge among those to whom these licenses will be issued. It will thus be made an object for fire insurance underwriters to recommend the introduction of electricity in preference to other means for producing artificial illumination and power. Licenses are to be of five classes, each class representing a certain extent of qualification.

It was stated at the meeting that the New England Insurance Exchange and the Boston Tariff Association were heartily in accord with the objects of the Exchange, and they had stated their entire approval of the plan of licensing employés. They believed that the holding of such licenses would be an important feature in their approving electric installations.

Gentlemen representating local electric enterprises from all sections of New England were present, and the movement is well started.

He Would.

To the Editor of the Electrical World:

SIR: Is it not evident that the following reveals a slight trace of God's knowledge of what He then knew *could* be done, and of what man would some day be able to do, when He said to Job, to convince him of his ignorance: "Canst thou send lightnings, that they may go and say unto thee, '*Here we are*?' "—*Job* 38, 35.

Would not Job, were he living at the present day, have answered: "Yes—by *telephone*?" B. E. H.

MOUNT HOLLY, Vt.

Analogies Between Mechanical and Electrical Engineering.

To the Editor of The Electrical World:

SIR: In THE ELECTRICAL WORLD of April 7, Mr. R. M. Hunter makes reply to my article of March 17. In speaking of the method of connecting up two steam engines as we would two series dynamos, and driving one as an electric motor and the other as an air motor, Mr. Hunter considers the analogy to be perfect; and yet his own statements prove it to be otherwise.

For the analogy to be complete it is necessary that the two engines be connected similar to the two dynamos, and as these are in series (+ to —), it is evident that the two engines, compressor and air motor, must be arranged in the same way, *i. e.*, supply to exhaust. Instead of this Mr. Hunter connects the supply ports of both compressor and motor together by a pipe, as may be seen by referring to Fig. 1 of this diagram (April 7). The analogy is, therefore, imperfect from his own point of view. Of course, with connections so arranged, his results would differ very materially from mine, and hence, his criticism.

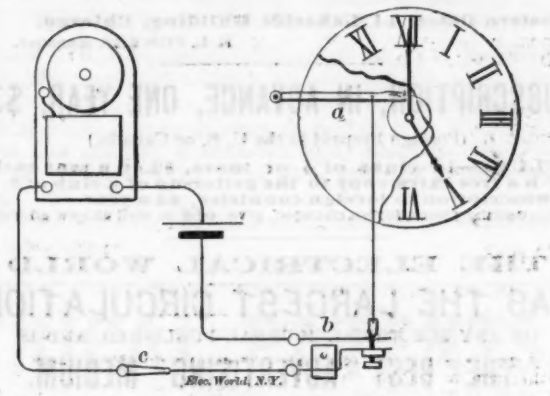
If Mr. Hunter will consider the motor and compressor to be connected, the supply of the second with the exhaust of the first, as I plainly stated in the article he is now criticising, I think he will fully agree with me that "as a matter of fact, it would run the same as when supplied with steam under ordinary conditions," and that the motor would run forward unlike an electric motor. A flaw, therefore, exists in his analogy.

PARIS, Tex. H. F. WATTS.

A Simple Alarm.

To the Editor of The Electrical World:

SIR: I inclose a sketch of an arrangement that your readers who have to rise early will appreciate, especially where the alarm clock is kept in a room other than the sleeping room. The ordinary electric bell with a few changes will answer, but it is necessary to have a switch to cut off the alarm, otherwise it would exhaust the battery and also ring the alarm twice in the 24 hours. The



A SIMPLE ALARM.

alarm indicator in the clock being set at the time required, as soon as the clock reaches that time the bar *A* drops into the notch, letting the alarm wire down and bringing the parts *b* in contact. This allows the current to flow to bell, the switch *c*, being closed. It works well and saves winding the alarm spring every time one wishes to be wakened. W. E. KAUKE.

BRYAN, O.

"Built-Up" Dynamo Plants.

To the Editor of The Electrical World:

SIR: I read with interest a communication in your issue of March 31 regarding "built-up" dynamos for central station work. It would seem that this method of construction might be used advantageously in many instances, but more especially where regulation is accomplished by shifting the brushes on the commutator, as in most arc dynamos and some (series) incandescent.

In this line the following forms, Figs. 1 and 2, suggested themselves to me some time ago. Fig. 1 was the first

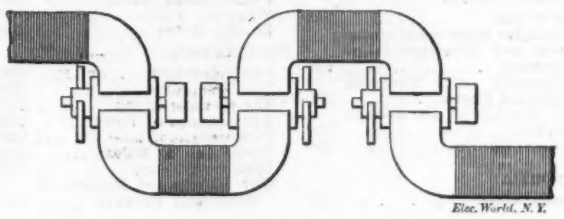


FIG. 1.—"BUILT-UP" DYNAMO PLANTS.

form which would naturally come to the mind's eye. In this there are mechanical objections as to belting. These, are, however, removed in Fig. 2, which shows only a portion of the complete machine. In this way several armatures could be run with very little more *ampère turns* in

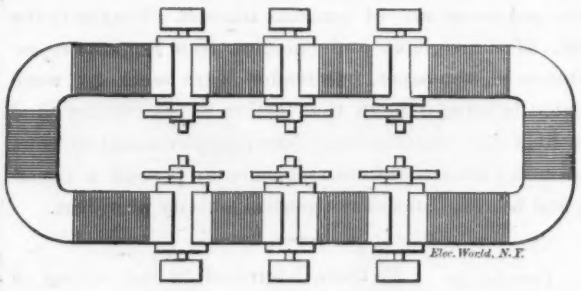


FIG. 2.—"BUILT-UP" DYNAMO PLANTS.

the compound field than by using only a single armature in a single machine. In a built-up machine like this, having six or more armatures, two might be wound to be used as "exciters," one to be used regularly and one as a duplicate in case of emergency. Or, perhaps a more economical plan would be to use part of the current from one of the armatures as in a common series or shunt machine.

The fields in this construction might be wound with perhaps only one layer of wire, thus affording extraordinary cooling capacity.

Taking into consideration the saving in power effected, and the ease of manufacture, and the fact that a plant of this kind can be increased by simply moving the *end* pieces farther away and inserting the proper connecting *fields*, it would appear to be in many cases an advantageous construction.

GREENCASTLE, IND. EWING MCLEAN.

The Electric Light Plant in the Amphion Academy, Brooklyn.

Theatre lighting within the last few years has made many advances and improvements, and the difficulties encountered in the past have been overcome. Great advancement has also been made in the scenic effects, both on the stage and in the house, over anything ever heretofore accomplished by the use of gas. The plants in the Amphion Academy, Brooklyn, and the new Broadway Theatre, in this city, were installed by the Edison United Manufacturing Company at about the same time, and are similar in many respects, and are by far the most complete plants of their kind ever installed by this company. A person unacquainted with theatrical lighting can form but a faint idea of the difficulties to be encountered in arranging such a plant. It is by far the most intricate class of lighting to arrange in order to obtain the desired results.

On the stage of the Amphion Academy alone there are over 450 lights, and this, with the auditorium and the front of the building, the reception room and lobbies in front, makes a total of over 1,200 lights in this plant. During plays, though, it is usual when the lights are on in the auditorium to switch out those on the stage, and *vice versa*; therefore, the requirements for actual running are not the total capacity except on rare occasions.

The generating plant shown in Fig. 2 consists of two Edison shunt wound dynamos, with a rated capacity of 600 lights each. They are capable, however, of generating current for 50 per cent. increase above this capacity if any emergency should demand it, one dynamo practically being capable of carrying the load usually called for. The machines have an ampère capacity of 320 ampères, and maximum voltage, 125 volts. The voltage of the lamps used here is 110, and the new Edison high economy 16 c. p. 3.1 watts lamps are used throughout the theatre, and under the severe use they have been here put to have given results far beyond what was expected of them as regards life, brilliancy, etc.

Every possible resource known to the company has been used here to make this plant safe and reliable and perfect in its operation. The best Habirshaw "Triplex" wire has been used throughout, and extra precaution has been taken in having an outside fireproof covering put over the wire. All cut-out boxes are lined with asbestos throughout, making them noncombustible, and all switches and cut-outs are made of porcelain.

The auditorium is considered by far the handsomest lighted of any theatre in Brooklyn. The decorators and the electric light company have combined to bring about this result. The ceiling represents a sky at nightfall, brilliantly illuminated with 50 incandescent stars, the tip of the bulb just coming below the ceiling. There are also four moons installed. Each moon is brilliantly illuminated with seventeen lamps placed behind the glass under a reflector. Around the front of the balconies, instead of the unsightly brackets usually seen in theatres, there are twenty-two bull's-eyes, behind each of which is an incandescent lamp, giving a very pleasing and subdued effect. The lighting in front of and above the boxes is also very handsome. Above the boxes is a circle of cathedral glass, behind which lamps are placed, giving, in connection with the draperies around the boxes, a very pleasing effect. On the proscenium arch over the stage is represented the rising sun, with lamps in concealment behind the glass, to give the desired effect.

The stage, however, is the most interesting part to one versed in electric lighting. Between the flies are placed five rows of border lights, each of which contains 42 amps; these throw light on the stage below. In most plays only two or three borders are used; in a few scenes, however, in plays where a large number of persons are on the stage, all the rows are used at once. There are also ten bunch-light connections, as they are called. These consist of eight lights placed on a standard with a vertical reflector, having a flexible cord 15 or 20 feet in length, which makes connection in a socket in the floor; these are placed in the flies at the side to throw effects on the stage where desired.

At the left-hand side of the stage is placed the switch-board, which, looking at it on the face, appears to be an intricate mass of switches and wires; but on examining the working plan shown in Fig. 1 it will be seen how comprehensively it is laid out. Any circuit for any of the different parts of the house and the lobbies in front may be controlled from this switch-board. The different sections of these circuits are placed on regulators together.

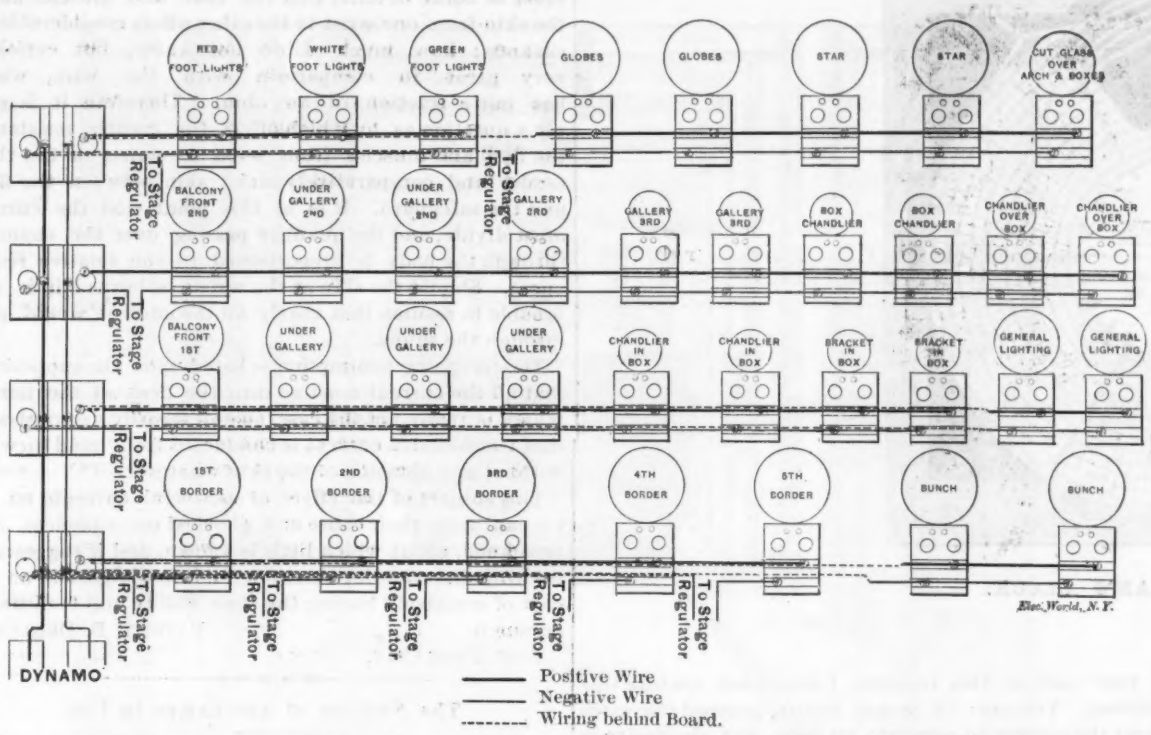


FIG. 1.—SWITCHBOARD CIRCUITS, EDISON PLANT, AMPHION THEATRE, BROOKLYN, N. Y.

The auditorium is placed on three regulators, one regulator being placed for the footlights, to be used either on the red, white or blue, there being three separate circuits. Each row of borders also has a regulator. These regulators, or main line resistances, as they might properly be called, are used for obtaining the effects desired in theatre lighting without throwing off the light entirely, as was previously required to be done. These regulators raise and lower the lights on their circuits without disturbing the brilliancy of any other circuit, and this is a factor which is the most desirable to obtain in theatre lighting. These resistances are placed under the stage, the switch handles for each one being placed directly under the switch-board. By drawing these handles over, the lights may be brought to any degree of brilliancy desired, the regulator boxes being divided into twenty-five sections or coils.

In the dynamo room, as mentioned above, are the two Edison dynamos, with a horizontal engine 13 × 12, of about 100 horse-power. The engraving illustrating this room gives a very good idea of the arrangement here. The space was somewhat more crowded than was desired, and the plant had to adapt itself to circumstances. Everything is convenient, though, for handling and controlling the plant in the proper way.

This plant was ordered by the Amphion Academy Co., through Mr. F. R. Chinnock, the agent of the Edison United Manufacturing Company for Long Island, and the wiring of the theatre was done by Mr. A. H. Rennie, contractor for the company, under the direction of the Engineering Department of the Edison United Mfg. Company.

The whole installation reflects great credit upon all connected with it, and shows the possibilities of electric lighting in theatres when properly installed. It is needless to say that the success obtained has convinced the theatre managers that on the points of economy, safety and brilliancy of effects, electric lighting is the only adequate means for theatre illumination. This fact which has already been recognized universally in Europe, is now being acknowledged throughout this country.

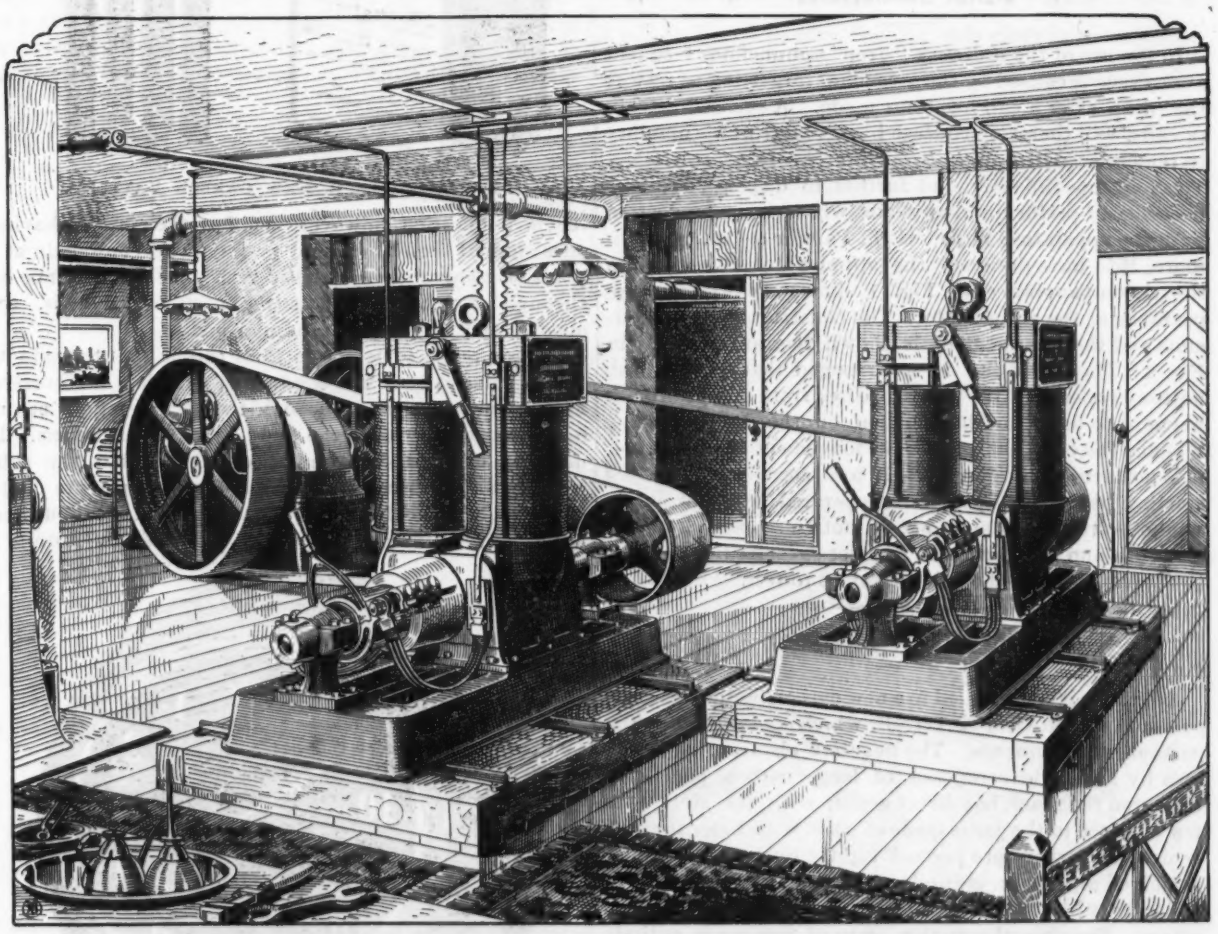


FIG. 2.—DYNAMO ROOM OF THE AMPHION THEATRE, EDISON PLANT.

Limitation of United States Patents.

At the hearing before Judge Wallace two weeks ago—mentioned last week—in the suit of the Edison Electric Light Company against the United States Electric Lighting Company, several very important questions were raised regarding the effect of foreign patents upon later American patents.

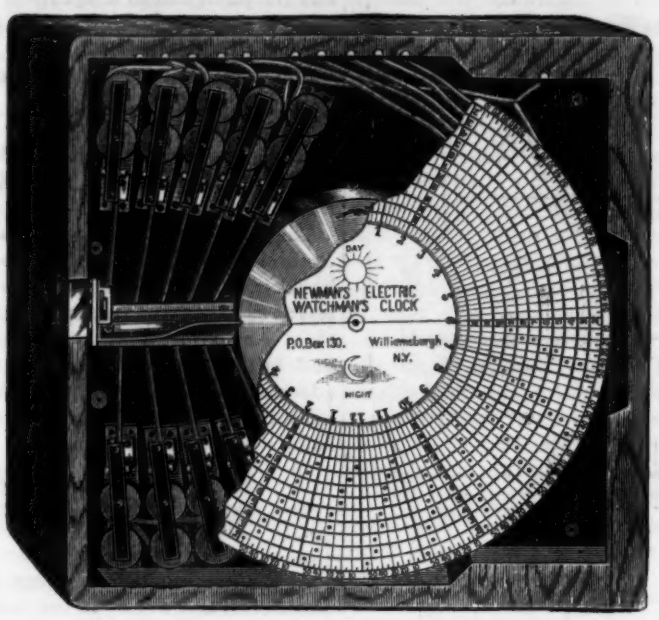
The case involves the interpretation of Section 4,887 of the Revised Statutes. It has already been decided in Paillard *vs.* Bruns, and other cases, that the terms of United States patents are not shortened by the lapsing of prior foreign patents due to the withholding of the annual taxes. The Edison Company now asks the court to decide whether Section 4,887 has any application whatever to an American inventor or patentee whose invention was made and reduced to practice in the United States.

Other points upon which decision is prayed for are: whether a prior foreign patent, the application for which was filed after the American application, limits the term of the American patent; whether an American inventor who has assigned his invention can defeat the rights of the assignee by procuring a foreign patent, pending the action of the American Patent Office; whether the language of a foreign patent fixes its term or the proven law of the foreign country; whether a foreign patent, to defeat an American patent, must not have been in existence at the date of the American application; and whether a foreign patent which has expired before the American patent was issued has any effect on the subsequent American patent.

These are questions which have an important bearing upon many patents besides those of the Edison Electric Light Company. Judge Wallace's decision will be awaited with lively interest.

New Watchman's Clock.

Our illustration represents Newman's watchman's clock, which has recently been brought out by the New Haven Clock Company of this city. The apparatus illustrated is arranged for ten stations, and is calculated to operate continuously for eight days without the renewal of



A NEW WATCHMAN'S CLOCK.

the card. As will be seen, the card is arranged for 24 hours per day, and is revolved by a clock movement which passes before a series of pins operated by the electro-magnets shown. The watchman at each station, by pressing a button, operates an electro-magnet, and a perforation is made in the paper, showing that he was at that point at the time indicated on the dial. The construction of the mechanism is such that any attempt to tamper with it is indicated on the instrument, the opening or closing of the case for instance puncturing the record sheet, and showing the exact time at which that operation was performed.

A Dial Annunciator.

In the use of the ordinary "drop" annunciator frequent annoyance is caused by the attendant forgetting to restore the drop after a call has been made. A succeeding call, or calls, will therefore confuse him because of his inability to remember which drop it was that he failed to restore. To avoid this difficulty, and further to dispense with the necessity of performing any act whatever in connection with the apparatus, Messrs. G. E. Painter & Co., of Baltimore, Md., have designed the annunciator illustrated in the accompanying cut. Fig. 1 shows the external appearance of the annunciator. The construction of the circuits and the arrangement is shown diagrammatically in Fig. 2. The apparatus is so arranged that when a push button is operated, the pointer passes from any position it happens to be in, to the position on the dial indicating whence the call came. After the movement of the pointer, it is not necessary to restore it to "zero," or to a fixed starting point. The pointer is operated by clock work, which is tripped into and out of motion at each closure of a circuit, and the particular magnet energized determines the point at which the pointer comes to rest.

A New Carbon Battery.

Attention is being called to a new carbon battery recently patented by Mr. Geo. E. Terrell, which contains many important improvements. The negative element, as will be seen by Fig. 2, is composed of large carbon pencils, so arranged that each has direct action with the zinc. The top or cover to the jar is made of cork, with holes through which the carbons are pressed tightly into metal springs, which clamp them securely, thus making an excellent contact with all of the carbons to the positive binding screw. The objection to this form of battery is entirely overcome from the fact that all the carbons are so treated that it is impossible for the solution to pass above a certain point, and the contact with the carbon is kept permanently free from corrosion, and consequently the battery will last indefinitely.

The top being of cork, it is made to fit the jar tightly, thus avoiding all evaporation or creeping salts, and seals it perfectly. Another feature of this battery is the resort to a large zinc rod instead of the small one generally used, which exposes a larger surface to the negative element and gives generally better satisfaction. Fig. 1 shows the general appearance of the complete cell, which is called the "Ideal," it being regarded as the finished and satisfactory result of very many practical experiments and tests. This battery has been adopted by the Standard Electric Time Co., of New Haven, Conn., who are the sole agents.

Protection of Linemen Against Shock.

To the Editor of The Electrical World:

SIR: Permit me to offer a few words of exception to your comment on the electrical safeguard in the last issue of your journal. Your comments are always so fair and so seldom faulty, that were it not for an evident oversight on your part in this instance, I would not venture this criticism. You say: "A person having grasped the wires allows the current to pass into his body, and the device is such that in order to become operative the current must pass out through the skin again at another point. It

FIGS. 1 AND 2.—A NEW CARBON BATTERY.

seems a question, however, whether the current, having once entered the body would prefer to pass out again at a point of comparatively higher resistance, or continue on through the better conducting portions, that is, the muscles and nerves of the human body."

The inference to be drawn from this is that the skin itself is practically a non-conductor, and that the current having burnt its way through to the inner flesh at the hands would not leave the body again at the wrists. It must be admitted in the first place that unless the skin were a pretty fair conductor no dangerous currents could enter the body at the hands where the skin is callous and hard. It is well known, however, that the skin is quite a

good conductor, inasmuch as even through the callous covering of the palm or fingers a shock from a few Daniell cells is felt; and it is a question whether the tender, thin skin at the wrists offers much more resistance than the inner flesh itself.

It has been proven by tests already made that a comparatively weak current, quite insufficient to burn the hands, is sensibly felt at the wrists, proving conclusively that a considerable portion of the current leaves the arms for the shunt wire. If, therefore, a current that may be received at the hands without danger or discomfort makes itself felt at the wrists where the bracelets come in contact with the tender skin, it must follow that a more powerful or dangerous current would be shunted in a proportionate degree; and it seems to me that a current sufficiently powerful to burn through the callous skin of the hands would also burn the tender skin at the wrists in passing to the safeguard, and thereby render it more efficient for the purpose of protection. It must be borne in mind that the flesh and muscles under the skin from one wrist to the other offers considerable resistance; how much I do not know, but certainly very great in comparison with the wire, which has but a fraction of an ohm. Therefore it is simply a question as to which offers the *greater* resistance, the flesh and muscles from wrist to wrist, or the thin, tender and comparatively moist skin between the flesh and the safeguard. It is at this point that the current must divide, and the quantity passing over the shunt or through the body is proportioned to the relative resistances. Should the skin at the wrists be burned it is reasonable to assume that nearly all the current would pass through the shunt.

The foregoing assumption is based upon the supposition that all the current must go into the flesh at the hands, which is really not the case, since it is easily demonstrable that considerable current is conducted from hand to wrist without any abrasion of the skin whatever.

This subject of the effect of powerful currents on the human body, their cause and physical consequences, is a broad one, about which little is known, and it suggests an inviting direction for research and investigation on the part of somebody having the time, ability and facilities to pursue it.

PATRICK B. DELANY.

NEW YORK CITY.

The Number of Arc Lamps in Use.

To the Editor of The Electrical World:

SIR: In the next issue of your very valuable paper, will you kindly state the estimated number of arc lamps at present in use in the United States? C. FESSENDEN.

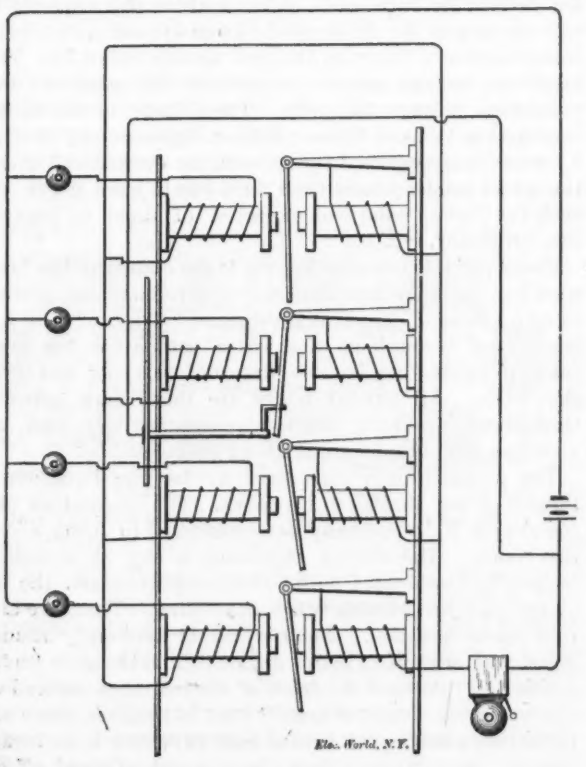
ANSWER.—The estimated number is about 200,000.—EDS. E. W.

Several Queries.

To the Editor of The Electrical World:

SIR: Will you please answer the following questions through your columns: (1) What do we understand by a consequent pole type of machine? (2) What is the theory of incandescent wiring, *i. e.*, why do we figure as we do for lamp installation? I have noticed several formulas for wiring, and one in THE ELECTRICAL WORLD several years ago, but no apparent reason for any work done. (3) What book can you recommend on figuring for intensity of fields, armature and coils, or on dynamo construction? (4) Have you ever published papers on dynamos or motor building, and if so, how many and where? C. L. A.

ANSWER.—(1.) A consequent pole machine is one in which two field magnets are so combined that their similar poles meet and form one pole of the same polarity.



FIGS. 1 AND 2.—A NEW DIAL ANNUNCIATOR.

(2.) As a rule the dimension of wires for incandescent lighting is proportioned so that the resistance of the wire shall be such as to cause a certain percentage of loss of E. M. F. between the source of supply and the terminals of the lamp. (3.) We can recommend to you for this purpose, Kapp's *Electric Transmission of Energy*, Hering's *Principles of Dynamo-Electric Machines*, and *Practical Directions for Winding Magnets for Dynamos*. (4.) We have published a large number of articles on these subjects for several years past, which can be found in all our volumes up to date.—EDS. E. W.

Electric Haulage in Cotton Mills.

About four months ago an installation was made at the Tremont and Suffolk Mills, at Lowell, Mass., which has excited considerable interest among mill men in that section of the country. One of the difficulties to be met in large mills running many thousands of spindles is the transporting and handling of cotton bales and heavy cases of cotton goods by the slow and expensive work of the ordinary day laborer. As the present buildings are located, all freight is received and delivered from one place. This necessitates some method of distributing the freight such as cotton bales, etc., from this spot, and also the gathering of the manufactured goods from over the mills and the storing of the same at the freight house. In order to accomplish this work by the aid of electricity, plans were submitted by the Thomson-Houston Electric Company, and in a few weeks a motor was designed and placed upon the specially constructed car of the superintendent. For the last three or four months this motor, Figs. 1 and 2, has been running, giving perfect satisfaction.

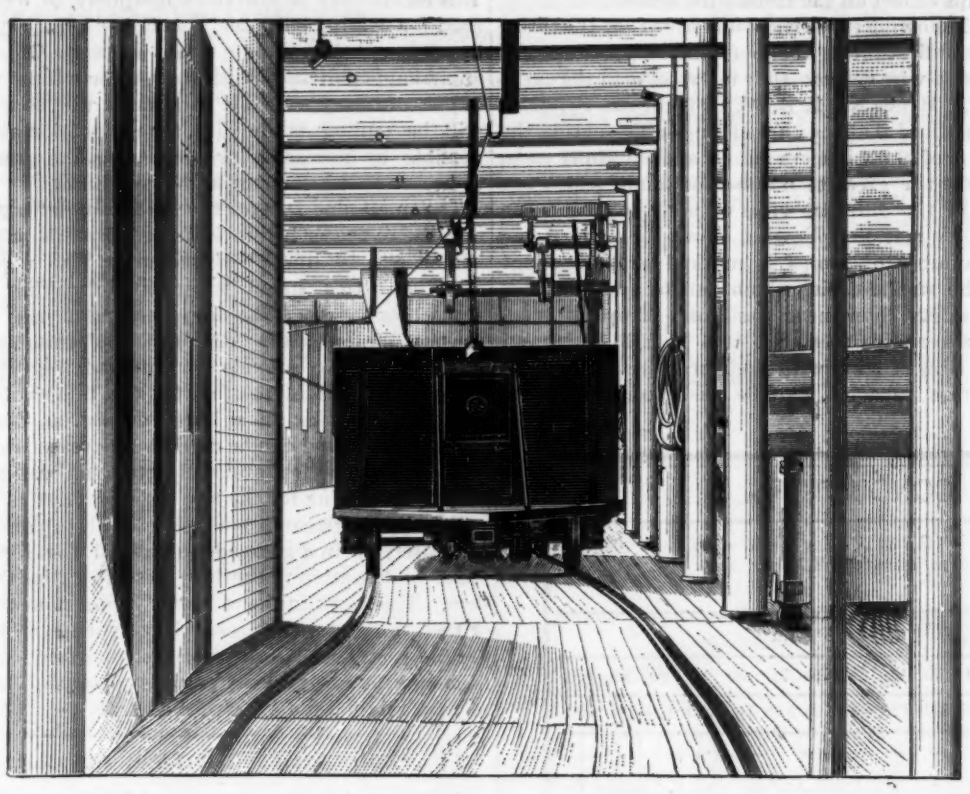


FIG. 1.—THOMSON-HOUSTON ELECTRIC ROAD IN MILL AT LOWELL, MASS.

The total distance of the road is 800 feet, running from one building across a bridge into another building and the entire length of the latter. This line is not a level one throughout, since the passage from one building to another introduces a grade of 3 to 3½ per cent. As shown in the accompanying illustrations, the system used is the single wire overhead method, the rails answering for the return. The motor has a capacity of about four tons, and the gauge of the track is 4 feet 8½ inches. The controlling arrangements consist simply of a reversing switch, a speed regulator and a brake handle, which have acted without failure through very trying work. From the day of its starting no trouble whatever has been experienced, and the mill owners are perfectly satisfied with its operation, and we believe that they contemplate a considerable extension to this line, as they find that it is one of the most convenient mechanical arrangements which they have about their whole mill.

A prominent mill engineer who got on the car recently and took several rides and examined its operation very closely, said that this system of collecting goods and carrying them to focal points is destined to a very general adoption.

If our readers are familiar with these large mills and the great floors several hundred feet long, they will readily see that a narrow-gauge track, running the entire length of the room upon the floor, can be laid, and a small platform motor used to gather the cloth as it is taken from the machines. The success of this installation has brought about a number of important arrangements, and we understand that the company, realizing its great importance, are preparing for a very extensive line of work in this direction.

Long Distance Telegraphy.

The recently announced claim of a telegraphic circuit of over six thousand miles, surpassing all previous experiments, is somewhat misleading. Many efforts at long circuit work have occurred during the past few years, the distance varying from 4,600 to 8,100 miles.

It is a matter of considerable pride to the old operators of the Western Union Telegraph Company in San Francisco, says the San Francisco *Alta*, that the feat of transmitting clock signals through 7,200 miles of line and communicaing directly through that same line has neverbeen equal·d. The occasion of this feat was the telegraphic determination of the difference of longitude in time between the United States Coast Survey Station in San Francisco and the observatory of the Harvard University at Cambridge in the year 1869. In order to determine the time of transmission of a signal either from the clock (or from the operator's key) over the given length of the line of 3,600 miles, three different methods were devised. One of these was original with Prof. George Davidson, who had charge of the observations. Through the liberality of the management of the Western Union Telegraph Company, a double circuit of line was looped at Cambridge, so that there extended from the San Francisco Observatory 3,600 miles to Cambridge, and the return from Cambridge by a somewhat different route of nearly equal length. The two "earths" were under the San Francisco Observatory, distant from each other not more than ten feet. The line was first opened by an operator in the observatory and when the last connection was made at Cambridge the San Francisco operator was considerably astonished to get his own message back within one second of time.

Then the astronomical break-circuit clock was thrown into line and made its first break on a pen recording upon a revolving cylinder of paper in the San Francisco Observatory, and after this break had traversed the line to Cambridge it returned and made a break upon a second pen moving parallel with the former in about eight-tenths of a second of time. This was continued every second for several minutes, and was repeated upon several nights, and when one of the twelve batteries in this long circuit was removed the wave length time was reduced to only sixty-five hundredths of a second. Communication was, of course, carried on at the same rate of speed. This feat over a line 7,200 miles in length has been unrivaled up to the present time, both as a practical working exhibit and a scientific success.

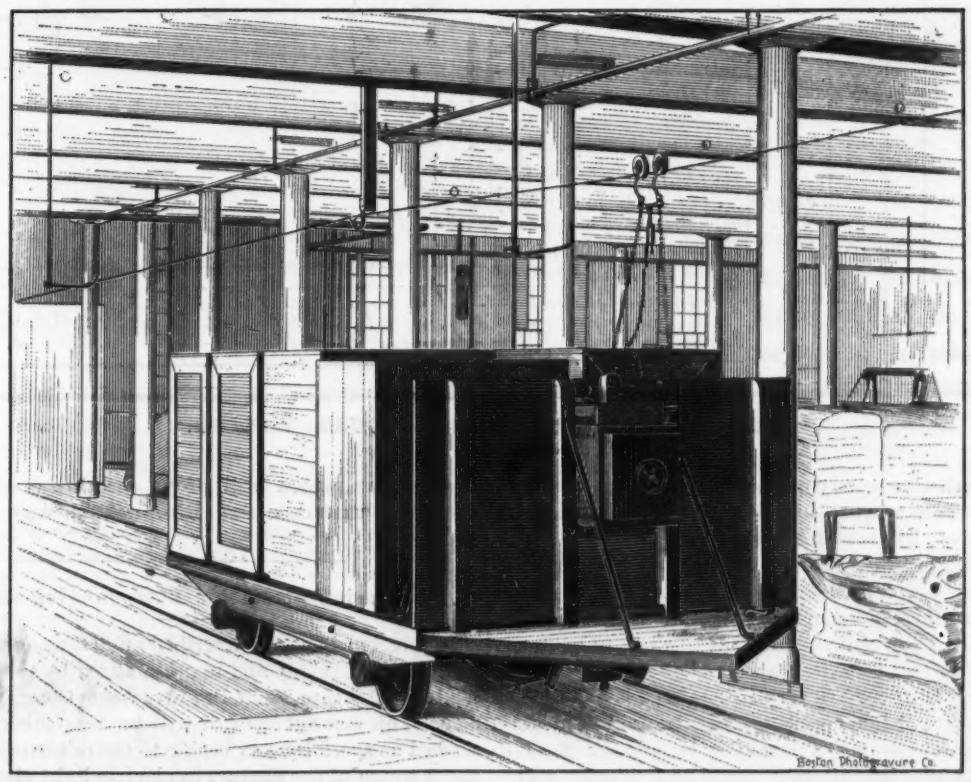


FIG. 2.—THOMSON-HOUSTON ELECTRIC ROAD IN MILL AT LOWELL, MASS.

Maturing Wines by Electricity.

M. Mengarini is continuing the investigations of Blaserna and Carpine upon the method of artificially maturing wines by the electric current. In his experiments a current of about four ampères was passed through the wine for periods of varying length. The electrodes, which are of platinum, become coated with a deposit which consists chiefly of albuminous substances. The proportion of alcohol was diminished by the formation of a small quantity of acetic acid, and also by evaporation. It is also probable that some of the alcohol was directly oxidized. The bouquet of the wine is developed almost exactly as if by lapse of time, and it was sensibly increased at every application of the current. The color is also modified. There is also reason to believe that the wine is sterilized, so as to be incapable of further change; but on this point M. Mengarini is not able to speak positively at present.

The Steam Electro-Magnet.

Many of our readers, like ourselves, says the London *Electrician* may have been under the impression that—whatever be the explanation of the fact—a core of iron becomes magnetized, in some degree, when a current of steam is caused to traverse with sufficient velocity a tube of copper, wound helically upon the core. The experimental result in question was first obtained, we understood, by M. Tommasi, and his results was subsequently confirmed by M. Thouvenot. A correspondent of *l'Electricien* now states that he has repeated the experiment with an entirely negative result, even with higher steam pressures than had been mentioned as necessary. Messrs. Tommasi and Thouvenot have, under these circumstances, been requested to render assistance or explanation; and the editor of the above-named paper is about to repeat the experiment for the satisfaction of those who are interested in the question.

Zone of Maximum Intensity in Arc Light.

According to the report upon arc lights of the committee charged with the photometric tests of lamps shown at the last Antwerp exhibition, if S equals the mean spherical luminous intensity, H = the horizontal luminous intensity, and M = the maximum luminous intensity; there exists between these three quantities the relation $S = \frac{H}{2} + \frac{M}{4}$. This empirical formula gives in most cases values which do not differ materially from those determined by exact calculation. The mean intensities of luminosity in each of the two hemispheres are fairly represented by $\frac{H}{4}$ for the superior hemisphere, and by $\frac{H+M}{4}$ for the inferior hemisphere. The zone of maximum intensity of light is the surface of a cone having the arc for its apex, and generated by a plane, one edge of which coincides with the vertical axis of the two carbons, the other edge making with this line an angle of about 50 degrees. It is to be understood, of course, that this zone of maximum luminous intensity is limited to the lower area of the conical figure thus described. This determination applies more particularly to arc lamps supplied by continuous currents.

A Diagram Showing the Size of Conductors for House Wiring.

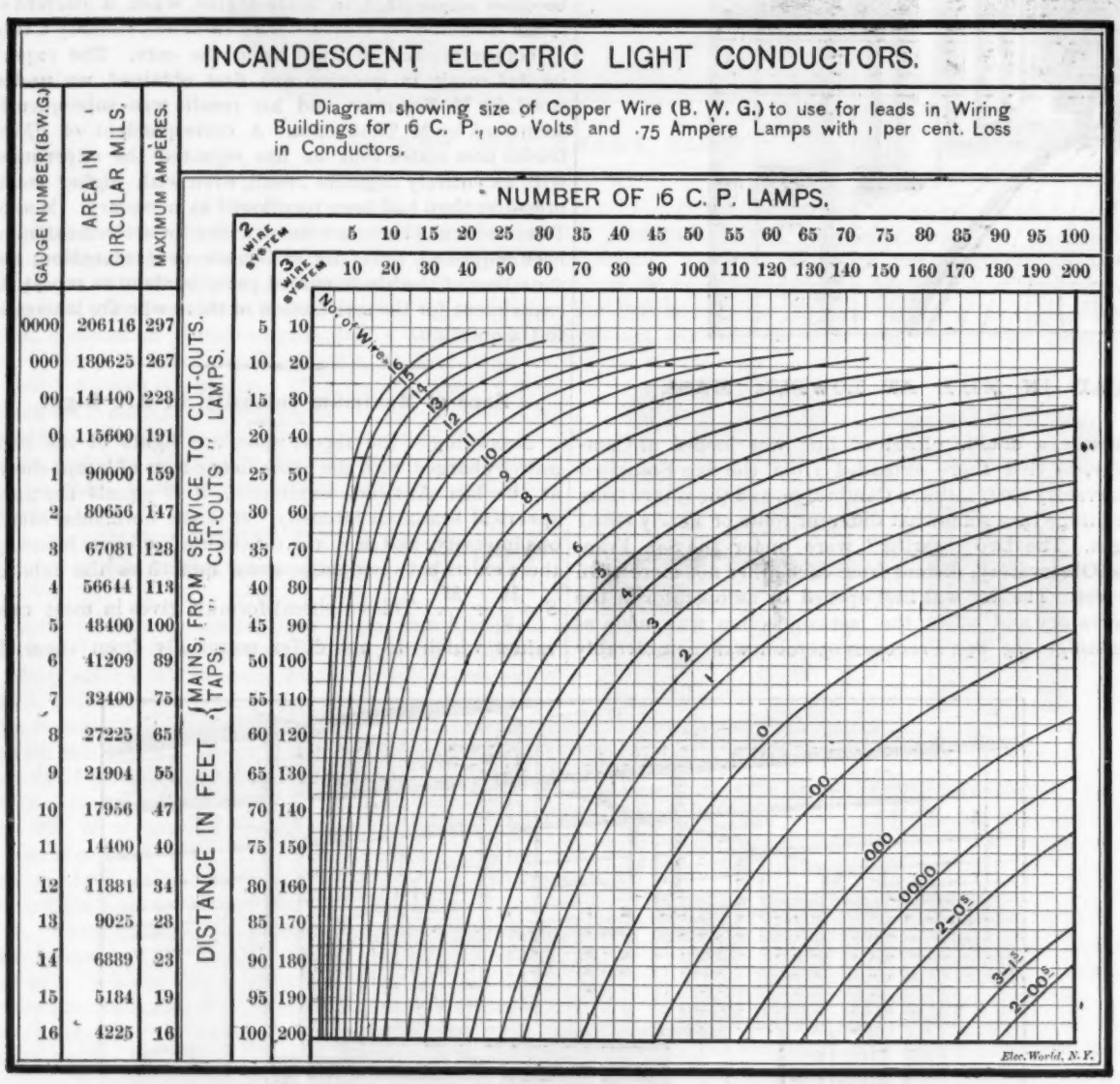
BY C. H. CROCKETT, BOSTON.

In central station systems of incandescent electric lighting, a graphic method for determining the sizes of the conductors, for wiring the premises of customers, will be found to be much more convenient than any rule or formula, however simple. The chances for mistakes are also less by the use of a graphic method than where repeated mathematical calculations are necessary.

In every healthy and growing central station there are, of course, many of these problems constantly occurring which differ from each other in only two of their factors, namely, the number of lamps to be installed and their distance from a given point. All the factors, such as the E. M. F. required at the lamp terminals, the economy of the lamps used, and the allowable fall of potential in the leads, are constants: the voltage and economy of the lamps depending on the particular system in use and the drop in the leads being a certain determined percentage of the potential difference at the lamps.

A diagram which will meet all requirements, showing at a glance the correct sizes of wire to use, can be easily constructed for any system of lighting and can be made of such dimensions as to be carried in the pocket.

All wiremen connected with a central station should be furnished with blue print copies, and the wiring of stores, offices, residences, etc., should be in strict accordance with the values given by these diagrams.


INCANDESCENT ELECTRIC LIGHT CONDUCTORS.
Diagram showing size of Copper Wire (B. W. G.) to use for leads in Wiring Buildings for 16 C. P., 100 Volts and .75 Ampere Lamps with 1 per cent. Loss in Conductors.
NUMBER OF 16 C. P. LAMPS.
GAUGE NUMBER (B.W.G.)
AREA IN CIRCULAR MILS.
MAXIMUM AMPERES.
DISTANCE IN FEET { MAINS, FROM SERVICE TO CUT-OUTS. TAPS, CUT-OUTS TO LAMPS.
2 WIRE SYSTEM
3 WIRE SYSTEM
No. of Wire
0000 206116 297
000 180625 267
00 144400 228
0 115600 191
1 90000 159
2 80656 147
3 67081 128
4 56644 113
5 48400 100
6 41209 89
7 32400 75
8 27225 65
9 21904 55
10 17956 47
11 14400 40
12 11881 34
13 9025 28
14 6889 23
15 5184 19
16 4225 16
Elec. World, N. Y.

SIZE OF CONDUCTORS FOR HOUSE WIRING.

A practical example of such a diagram is here presented. It was designed for 100 volt .75 ampère 16 c. p. lamps for the two or three-wire system, with a loss of E. M. F. in the leads of 1 per cent., one-half of this loss to be in the mains, and one-half to be in the tap or branch wires.

The method of using it is very simple, and is as follows: Follow the vertical line directly under the number representing the total number of lamps to be put in until it meets a horizontal line directly opposite a number corresponding to the average lamp distance of the cut-outs from the service wires. The nearest curved line to this junction of the vertical and horizontal lines will be marked with the gauge number of the wire to use for the mains.

For a tap or branch wire, determine the number of lamps supplied by such wire and the average distance of these lamps from the cut-out or junction with the mains. Follow the corresponding vertical and horizontal lines on the diagram until they meet, and the nearest curved line will indicate the proper size of wire to use, as was the case with the mains.

As before stated the diagram is constructed for use with the two or three-wire system. For two-wire circuits the upper row of figures for the lamps and the left hand column of figures for the distances are to be used; for three wire circuits the lower row and right hand column are to be used.

The following two examples will illustrate the use of the diagram:

1. Required to find the size of conductor necessary to carry 20 16 c. p. lamps of the quality assumed to a distance of 40 feet on the two-wire system.

ANSWER: Following the vertical line under "20" at the top downward until it meets the horizontal line opposite "40" at the left, they intersect each other near the curve marked "8." Hence No. 8 B. W. G. is the size of conductor required.

2. Required to find the size of conductor necessary to carry 30 lamps 50 feet on the three-wire system.

ANSWER: Following the vertical under "30" in the three-wire column until it meets the horizontal opposite "50," also in the three-wire column, they intersect near the curve marked "12." Hence No. 12 B. W. G. is the size required.

It will be noticed that the curved lines representing the gauge number of the wires are cut off at their upper ends, stopping under the greatest number of lamps which can be supplied by the different wires without heating. The first curved line met in following down the vertical line under any number of lamps is marked with the gauge number of the smallest wire which can be used for these lamps with safety; how near the limit of safety is approached is also readily seen.

A table of sizes of wire, with their cross sectional areas and safe current capacity, can be easily combined with the diagram, which will prove a valuable addition. In this particular case the Birmingham wire gauge was adopted.

Reheating Steam for Compounding Engines.

In a recent issue we described an arrangement designed by Mr. Levi Hussey and manufactured by the Hussey Reheater and Steam Plant Improvement Company, of this city. This arrangement, it will be remembered, was described as specially serviceable to the reheating of the exhaust steam of the engines in electric light plants, so as to give it additional value for the purpose of heating buildings and similar work. The good results obtained with the reheater have now led to its adaptation to a much wider field, and an arrangement has been devised for employing it for the purpose of compounding steam engines, and we understand that several electr ic light stations will shortly be equipped in this way.

The illustration on page 203 shows the manner in which the apparatus is applied. Live steam from the boiler is taken to the high pressure engine by the pipe *A*. The exhaust from this engine, instead of escaping into the atmosphere, is taken to the re-heater by the pipe *B*. Here it meets the furnace gases on their way to the chimney, and the condensed water entrained in the steam is re-evaporated so as to give additional expansive force to the steam. Finally, the steam at increased pressure passes out into the pipe *E* and into the low pressure engine where it is allowed to expand to its lowest limit. Under these conditions, the re-heater is in effect a large reservoir or receiver between the condensing and non-condensing cylinders of the system, but the two engines, or the two sets of engines, acting quite independently, it is necessary to provide for keeping the pressure in the re-heater about uniform. This is accomplished by any convenient form of relief valve. For example, if it is found that a pressure of ten pounds, by gauge, in the re-heater will give the proper division of effect as between the high-pressure and the low-pressure service, then this relief valve will be set to allow any excess of pressure above that to escape. This escape may be into the atmosphere, or when steam is used for heating purposes a suitable reducing valve may be used, and the escaping steam utilized. Of course such an arrangement and division of power will be made, that, under ordinary working conditions, the escaping steam will be trifling in amount, a modification always being possible by increasing or decreasing the pressure in the re-heater to suit changes in the conditions.

The small pipe *D* is for the purpose of letting live steam into the re-heater before starting. By this means the re-heater can be filled with steam to the required pressure, and this steam superheated, making everything ready for starting the low-pressure at the same time as the high-pressure engines. By suitable provision it is possible to provide for superheating the exhaust steam to any extent possible by the temperature of the escaping gases, or in a lower degree, as desired. The steam thus heated can be carried any reasonable distance without liquefaction, and still retain an excess of heat thereby providing for the low-pressure part of the plant not only dry steam, but steam still superheated, so as to entirely or in a great degree avoid the loss resulting from condensation in the low-pressure cylinder or cylinders. This work in the re-heater being done without use of fuel, must, it seems, result in very material gain. And the fact that there is no necessary connection between the high and the low-pressure engines permits of an arrangement of engines not otherwise possible.

Rules for Electric Light Installation.

We give below the rules and requirements of the New England Insurance Exchange for electric lighting by the arc and incandescent systems, adopted March 1, 1888, and superseding all previous rules.

Arc.

OUTSIDE WIRES.

1. All outside overhead wires must be covered with some material of high insulating power, not easily abraded, and impervious to moisture; and they must be firmly secured to properly insulated and substantially built supports. All tie wires must be insulated the same as conducting wires.

2. All joints must be so made that a perfectly secure and unvarying connection, fully equal to the cross-section of the conducting wire, will be secured—and they should be soldered. Resin must not be used as a flux. Nothing stronger than a 10 per cent. acid solution should be used, and any excess should be washed off before the splice is covered. This also applies to inside wires. All joints must be securely wrapped with at least five layers or ply of an approved tape.

3. Care must be taken that conducting-wires are not placed in such position that it would be easy for water, or any liquid, to form cross connection between them, and they should not approach each other nearer than one foot.

4. The wires must never be allowed in contact with any substance other than air, and their proper insulating supports.

5. Conducting-wires carried over or attached to buildings *must* be at least seven feet above the highest point of flat roofs, and one foot above the ridge of pitch roofs. Lines constructed subsequent to the adoption of these regulations should not be run over and attached to buildings other than those in which the light or power is being or is to be used, but should be on separate poles, where they can be easily reached for inspection.

6. When they are in proximity to other conducting wires, or any substance likely to divert any portion of the current, *dead*, *insulated* guard-irons must be placed so as to prevent any possibility of contact in case of accident to the wires or their supports. The same precautions must be taken where sharp angles occur in the line wires, and also where any wires (telegraph, telephone or others) could possibly, owing to their position, come in contact with the electric light wires.

7. Overhead wires from the main circuit or pole in the street to the terminal insulators attached to buildings, and at the point where they enter a building, must not be less than twelve inches apart. They must be rigidly and neatly run and supported by glass or porcelain insulators or rubber hooks. The rubber hooks must be of an approved pattern, *i. e.*, with the rubber insulation free from flaws, and projecting over the hook in cup form.

8. Service blocks must be protected by at least two coats of water-proof paint over their entire surface, and when used to support rubber hooks, must have at least one inch of wood between the inner end of the hook and the back of the block.

9. For entering buildings wires with an extra heavy water-proof insulation must be used from the terminal insulators outside to the inside of a building. They must loop down so that water may drip off without entering the building, and the holes through which they enter must slant upward.

10. Service wires must come in contact with nothing save air, and their insulating supports, except in unavoidable cases, when a wire with an extra heavy insulation suitable for the purpose must be used.

11. The use of porcelain knobs as insulators, except in perfectly dry places, or for the support of specially insulated wire, will not be allowed.

12. Soft rubber tubing will not be accepted as a durable water-proof insulation.

13. Wires must enter and leave a building at the same point, and through an approved cut-out switch.

14. The cut-out switch must be "double contact," and should effectually close the main circuit, and cut off the interior, when turned "off." It must be so constructed that there shall be no arc between the points when thrown "on" or "off." It should be automatic in its action in either direction, not stopping between points when once started. It should indicate upon inspection whether current be "on" or "off."

15. It must be mounted on a non-conducting base, kept free from moisture, and be easy of access to firemen and police.

INSIDE WIRES.

16. All wires must be run on walls or ceilings in plain sight, and so as to be open to inspection at any time. They should be kept apart at least twelve inches.

17. In perfectly dry places they may be supported by cleats of wood or porcelain.

18. In wet or damp places a specially insulated water-proof wire must be used, supported by glass or porcelain insulators, or hard rubber hooks.

19. When wires pass through walls, floors, partitions, etc., in-doors, an extra sheathing of wood or hard rubber should be used. Wires must never be left exposed to disturbance or mechanical injury.

ARC LAMPS.

20. The frames and other exposed parts of arc lamps must be carefully insulated from the circuit.

21. Each lamp must be provided with a proper hand switch, and also with an automatic switch which will shunt the current around the carbons should they fail to feed properly.

22. Stops of some kind must be provided to prevent the carbons from falling out in case their clamps fail to hold them; and these stops must always be in place when the lamp is burning.

23. Lamps must be provided with globes that are closed at the bottom. When placed near combustible material, flyings in fabric factories, or in wood-working establishments, etc., very high globes or spark-arresters surrounded by wire netting must be used. Globes, when broken, must be immediately replaced.

24. Electrical connection between the conducting wires and lamps must be made through a suitable "hanger-board" and rods on which the lamp is hung.

INCANDESCENT LAMPS ON ARC-LIGHT CIRCUITS.

25. The rules for running wires for arc lamps apply also to incandescent lamps run in series.

26. These must be provided with a proper hand switch, and also with an automatic switch or other device which will shunt the circuit around the carbon filament should it break, and thus prevent the maintenance of an arc beyond the terminals of the wires inside the globe.

MULTIPLE SERIES BOXES OR DISTRIBUTERS.

27. Distributors must have the approval of the Exchange before they are put in operation.

28. Wires leading to the distributor, or to supply a series of individual distributors, must be at least twelve inches apart.

29. Wires must be run in plain sight.

30. Wires running from distributor or regulator to the fixtures and lamps, and from mains to individual distributors, must be kept three inches apart.

31. The safety fuses must be so proportioned that they will melt long before the wire is heated to an unsafe degree.

32. Dust must not be allowed in the distributor box, or on any of the electrical connections.

33. The contact points should be kept clean; solid electrical connections must be secured, and parts kept free to move easily.

34. In case any defect should arise in the distributor or regulator, or the wiring thereto, it must be arranged so as to automatically and absolutely shunt off from the main circuit.

35. Individual distributors must not be hung from the ceiling by a flexible conducting cord or cable, but should be rigidly attached to the ceiling by means of a pipe connection. The distributor must not be less than six inches from the ceiling. It should not be hung or placed near any inflammable material. Broken lamps must be replaced at once, or the entire series turned off.

36. Key-sockets as a rule must not be used on individual lamps. The pipes or fixtures should be fastened to a wooden block before being fixed to the walls or ceiling.

37. Lamps, distributors, or electroliers must not be attached to any gas-pipe or fixture which may be electrically connected with the earth.

DYNAMOS AND MOTORS.

38. Dynamos and motors must be located in a dry place, not exposed to flyings of combustible materials, and must be well insulated upon dry, well varnished wooden foundations. They must be kept thoroughly clean and dry.

39. The wires leading to motors should be separated at least twelve inches from each other, and must be provided with an approved cut-out switch, at the point where they enter the building. The same precautions must be observed in entering the building that are required for lighting circuits.

TESTING.

40. All circuits should be tested at least twice a day with a suitable magneto, in order to discover any escapes to ground that may exist. One test should be made in the morning and another in ample time before starting, to remove any defect, should it be found to exist. The rules for testing should be observed in any separate or isolated plant the same as in central stations.

41. The New England Insurance Exchange reserves the right at any time to add to, change or modify these rules, and to enforce such modifications, changes, etc., as it shall deem necessary for safety; and it will use all reasonable efforts to promptly notify all electric light companies of any change.

42. The signing of these rules by any electric lighting company, or persons controlling electric lights, shall be considered as a guaranty on their part that they will have the testing performed on their circuits or lines as above required.

Incandescent System.

OUTSIDE WIRES.

1. All outside overhead wires must be covered with some material of high insulating power, not easily abraded, and impervious to moisture; and they must be firmly secured to properly insulated and substantially built supports. All tie wires must be insulated the same as conducting wires.

2. All joints must be so made that a perfectly secure and unvarying connection, fully equal to the cross-section of the conducting wire, will be secured—and they should be soldered. All joints must be securely wrapped with at least five layers or ply of an approved tape.

3. Care must be taken that conducting wires are not placed in such position that it would be easy for water, or any liquid, to form cross-connection between them, and they should not approach each other nearer than one foot.

4. The wires must never be allowed in contact with any substance other than air, and their proper insulating supports.

5. Conducting wires carried over or attached to buildings *must* be at least seven feet above the highest point of flat roofs, and one foot above the ridge of pitch roofs.

6. When they are in proximity to other conducting wires, or any substance likely to divert any portion of the current, *dead, insulated* guard-irons must be placed so as to prevent any possibility of contact in case of accident to the wires or their supports. The same precautions must be taken where sharp angles occur in the line wires, and also where any wires (telegraph, telephone or others) could possibly, owing to their position, come in contact with the electric light wires.

7. Lines constructed subsequent to the adoption of these regulations should not be run over and attached to buildings other than those in which the light or power is being, or is to be used, but should be on separate poles, where they can be easily reached for inspection.

8. Overhead service wires from street mains to main cut-out inside of building must be separated by a distance of not less than six inches, for currents having an electromotive force of 130 volts or less, and this distance must be increased for currents of higher potential.

9. They must also be rigidly and neatly run, and must be supported by glass or porcelain insulators or by rubber hooks. Rubber hooks must be of an improved pattern; *i. e.*, with the rubber insulation free from flaws, and projecting over the hook in cup form.

10. Service blocks must be protected by at least two coats of water-proof paint over their entire surface; and when used to support rubber hooks, must have at least one inch of wood between the inner end of the hook and the back of the block.

11. For entering buildings, wires of extra heavy and durable water-proof insulation, protected by an outside covering not easily abraded, must be used from the terminal insulators outside to the main cut-out inside of the building. They must loop down so that water may drip off without entering the building, and the holes through which they enter must slant upward.

12. Service wires must come in contact with nothing save air, and their insulating supports, except in unavoidable cases, when a wire with an extra heavy insulation suitable for the purpose must be used.

13. The use of porcelain knobs as insulators, except in perfectly dry places, or for the support of a specially insulated wire, will not be allowed.

UNDERGROUND SERVICES.

14. Where underground service conductors, inclosed in a metal tube, enter a building special care must be taken at the point where the conductors leave the tube, and thence to the main cut-out, to protect them in such a manner that they cannot come in contact with each other, nor with the tube, nor be acted upon by falling moisture, nor disturbed by anything being moved against them, etc.

15. This service must not end at any place where it would be unsafe or undesirable to place a cut-out, but should be continued by means of specially insulated conductors to a suitable location.

INSIDE WIRING.

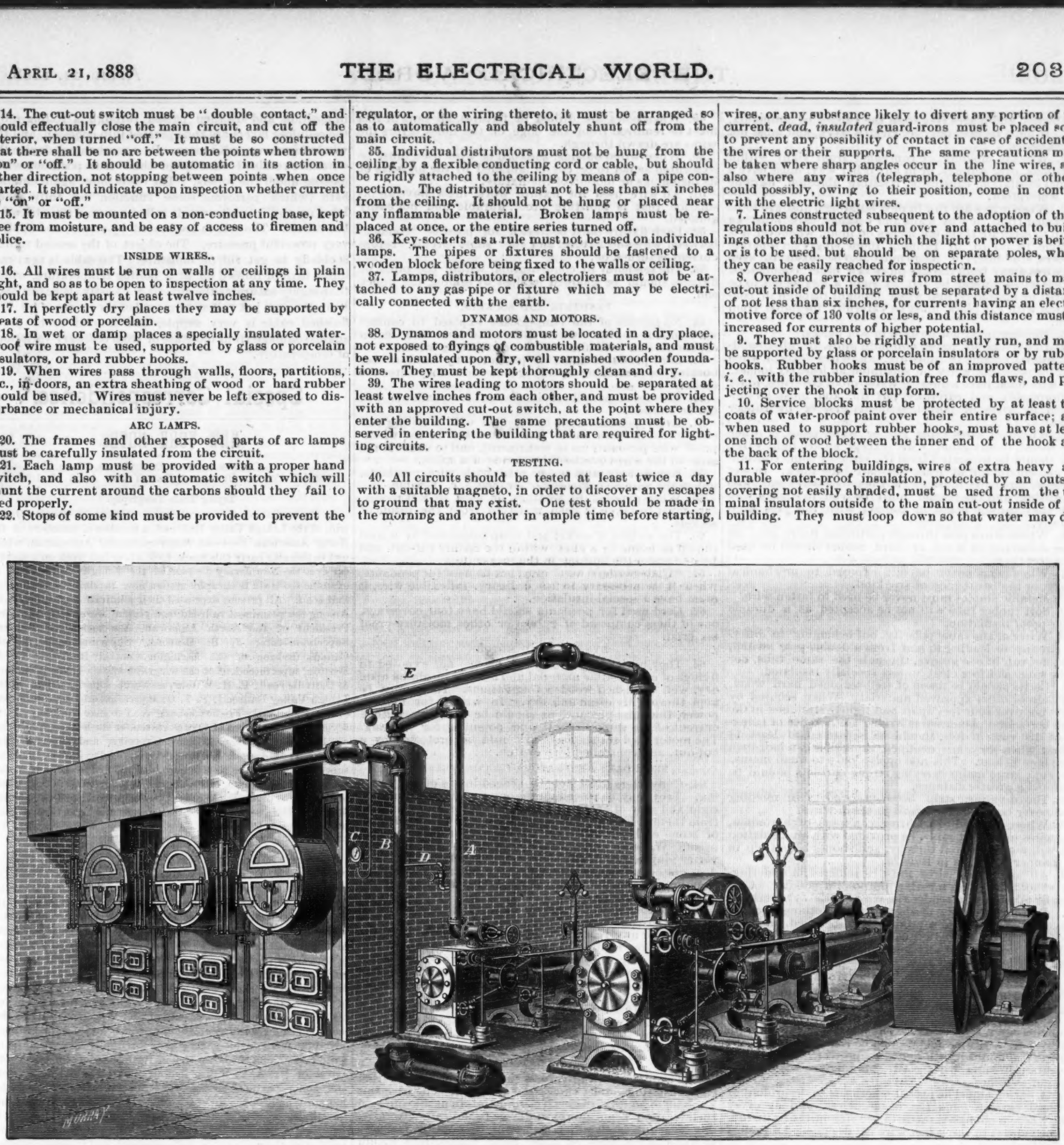
16. Copper wire used for incandescent lighting must be procured from manufacturers whose products have been found, by reliable tests, to be at least 95 per cent. pure copper. Samples of wire to be used, or in actual use, must be submitted to this Exchange, for tests of conductivity, at any time when required.

17. Permission will not be granted for the use of lights unless the wire comes fully up to the standard of conductivity, no matter how well the wiring may be done.

18. All parties, firms, or corporations proposing to do construction work or wiring, either outside or inside, must first satisfy this Exchange of their ability to do so in a safe and acceptable manner.

19. Before using any new forms of insulation for concealed work, the approval of this Exchange for its use under the proposed circumstances must be secured.

20. "Underwriters' wire" must be used only in perfectly



METHOD OF COMPOUNDING ENGINES IN ELICTRIC LIGHT PLANTS.

dry places, and places free from the vapors of ammonia, etc. It must be used only for cleated work, and must not be concealed.

21. Wires in molding, or concealed from sight within partitions, over ceilings, or in any other way, must have a special insulation, capable of resisting abrasion, durable and waterproof.

22. When wires are run in new buildings, and are to be concealed from view by walls and ceilings, care must be taken to separate them ten inches or more, whenever it is possible to do so, by running them singly on separate timbers, studding, etc. Care must also be taken to keep the wires away from the gas-pipes and other conductors. Outlet wires should be left in such a way as not to be injured by plasterers, and when brought through in connection with gas pipes, must be carefully insulated from them.

23. Molding must not be used in wet places.

24. In dye-houses, paper and pulp mills, or other buildings specially liable to moisture, all wires (except when used for pendants) must be separated at least six inches. The wire must have a durable water-proof covering, must be thoroughly and carefully put up, and must be supported by glass or porcelain insulators, or by rubber hooks.

25. Wherever wires cross gas or water pipes, or other bare metal, or any other wire (except an arc light wire), they should be separated from the same by some continuous non-conductor at least one-half inch thick. In wet places an air-space must be left between wires and pipes in crossing, and the former must be run in such a way that they cannot come in contact with the pipe accidentally.

26. Where wires pass through partitions, floors, etc., an outer sheathing of wood or hard rubber should be used to protect them.

27. Wires must never be left exposed to mechanical injury, or to disturbance of any kind.

28. Metallic staples must never be used to fasten wire.

29. Soft rubber tube will not be accepted as a durable water-proof insulation.

30. Wires of the same polarity, but belonging to different circuits, or leading to and from a double-pole switch, must not run in one groove, through the same tube, nor in the same slot in a cleat, unless specially insulated.

31. Cleats should be made of well-seasoned hard wood, porcelain or other approved material. When secured by cleats not over four feet apart and tightly stretched in the same horizontal plane, wires having a difference of potential of 120 volts or less, should be separated at least 1½ inches; when they are confined in molding, a half-inch space is sufficient. This rule applies only to small mains, taps, etc.; large mains carrying strong currents should be separated a greater distance.

32. The dividing strip between grooves in molding must never be cut out to admit joints in wires.

33. Where exposed to acid fumes, vapors of ammonia, etc., wires must of course, be provided with an insulation that will not be injured thereby, and should be put up in the manner described in Rule 25.

34. All splices in wires must be soldered; a soldering-bolt should be used for this purpose, if possible. Care must be taken not to render the wire brittle by overheating. Resin must not be used as a flux. Nothing stronger than a 10 per cent. acid solution should be used, and any excess should be washed off before the splice is covered.

35. The insulation of any joint must be equal to that of other parts of the same wire.

SAFETY CUT-OUTS AND SWITCHES.

36. Every part of the system of conductors must be protected by safety cut outs that will interrupt the passage through any conductor of a current stronger than that conductor can safely carry. The carrying capacity (in ampères) of a fusible metal must be less than that of the smallest conductor it is designed to protect. Conductors, of course, include wire, cord, binding-screws, contact points of switches, sockets, cut-outs, etc.

37. A cut out must be placed where the underground or overhead service joins the inside wires, and at every point where a change is made in the size of the wire (unless the cut-out in the larger wire be designed to protect the smaller).

38. Cut-outs, switches, and other devices which occasion a break in the insulation, must be so mounted that leakage of electricity from them is impossible, must not be put in places liable to become damp, must be protected from rubbish, etc., and should be easy of access.

39 Where it is necessary to use cut outs and switches in damp places, great care must be taken to protect them from moisture, and to use only such as are provided with bases that will not absorb moisture.

40. When necessary, cut-out connections must be covered with some fire-proof and water repelling material.

41. Cut-outs connected for carrying five ampères or more, must be double-pole.

42. The plug or other device for inclosing or supporting the fusible strip or wire must be incombustible and moisture proof, and so constructed that an arc cannot be maintained across its terminals through the vaporizing of the fusible metal.

43. No lead or composition strips carrying fifty ampères or upward before melting, must be used, unless provided with contact surfaces of some harder material having perfect electrical connection with the fusible part of the strip.

44. All switches must have a firm and secure contact that will make and break readily, and that will not stick between "full on" and "off," nor get out of repair easily in other ways. The points of contact must not be allowed to scrape or rub the entire surface of an insulating material between the contact strips; an air-space must intervene. The carrying capacity of the different parts must be sufficient to prevent heating.

45. Where points varying widely in potential are brought near each other by means of cut-outs, or switches, hard rubber, lava, or other approved material must be used in the construction of the cut-outs and switches.

46. Switches carrying five ampères and upward should be double-pole, particularly when the circuits which they operate are connected to fixtures attached to gas-pipes.

47. On any one fixture, no group of lamps requiring a current of seven ampères or over must be ultimately dependent on one cut-out.

FIXTURE WORK.

48. In all cases where wires are concealed within or attached to fixtures, the latter must be insulated from the gas-pipe, by some device approved by this Exchange. An exception to this rule will sometimes be made in the case of a gas-bracket wired for one or two lights.

49. When holes are drilled in fixtures, all burs or fins must be removed from the edge of the holes before the wires are drawn through.

50. When wired outside, the cord or wire used must be so secured as not to be cut or abraded by the pressure of its fastenings or motion of the fixture.

51. All wire used for fixture work must have an insulation that is moisture proof, durable and not easily abraded.

52. Each fixture must be tested for possible "contact" between wire and fixture, and for "short circuit," before current is turned on.

53. The tendency to condensation within the pipes of fixtures should be guarded against by sealing the upper end.

PENDANTS AND SOCKETS.

54. No portion of the lamp-socket exposed to contact with outside objects must be allowed to come into electrical connection with either of the conducting wires.

55. Cord pendants must be protected by hard rubber bushing, or something equally good, where they enter the socket.

56. The use of paraffined insulation for pendants will not be allowed.

57. Every pendant must be supplied with a ceiling cut-out, except in cases where it is necessary to use water-proof wire pendants (as in wet rooms), and to connect the same to the wires overhead by means of a splice.

58. Key sockets must not be used with wire pendants, unless the wire be composed of strands, *i. e.*, flexible.

59. When exposed to weather, or used in wet rooms, care must be taken to keep moisture from the inside of sockets.

60. The weight of socket and lamp suspended by a cord should be borne by a knot within the ceiling cut-out, and by one under the bushing in the socket.

61. "Underwriters' wire" must not be used for pendants, when it is necessary to use ordinary, inflexible wire, it must have a special insulation.

62. Cord used for pendants should have four coverings, one of them composed of rubber or other moisture-proof material.

DYNAMOS AND MOTORS.

63. They must be located in dry places, not exposed to flyings of combustible material, and must be insulated upon dry, well varnished wooden foundations. They must be kept thoroughly clean and dry. In wiring for motive-power, the same precautions should be taken as with a current of the same strength and potential for lighting. The motor (and resistance box) should be protected by a cut-out, and controlled by a switch.

SECONDARY GENERATORS OR CONVERTERS.

64. Converters must not be placed inside of any building. They may be placed on the outer walls when in plain sight and easy of access, but must be thoroughly insulated from them. If placed on wooden walls, or the wood-work of stone or brick buildings, the insulation must be fire-proof. When an underground service is used, the converter may be put in any convenient place that is dry, and does not open into the interior of the building—this location must have the approval of the inspector before the current is turned on.

65. The converter should be inclosed in a metallic or non-combustible case.

66. If, for any reason, it becomes necessary that the primary wires leading to and from the converter should enter a building, they must be kept apart a distance of not less than twelve inches, and the same distance from all other conducting bodies. The insulation of the wire must be of the very best.

67. Safety fuses should be placed in both the primary and secondary wires in the converter. Secondary wires after leaving the converter will be subject to rules already given for service, inside wiring, etc.

MISCELLANEOUS.

68. Companies or individuals furnishing electricity from central stations, must enter into an agreement with this Exchange, binding themselves to maintain at all times in their station some approved device to indicate instantly, any escape to earth which may tend to develop leakages to water or gas pipes, or other earth connections within buildings. This approved means of testing shall also apply to separate or isolated plants, where special conditions of moisture exist, or in buildings subject to mechanical changes of piping, etc.

69. The signing of these Rules and Requirements shall constitute and be considered an agreement on the part of the signer, that such approved automatic device or tell-tale shall at all times be employed on their circuits.

70. The wiring in any building must test free from "grounds" before the current is turned on. This test may be made with a magneto that will ring through a resistance of 10,000 ohms, where currents of less than 200 volts potential are used.

71. All incandescent work should be inspected before the current is turned on.

72. The New England Insurance Exchange reserves the right at any time to add to, change or modify these rules, and to enforce such modifications, changes, etc., as it shall deem necessary for safety; and it will use all reasonable efforts to promptly notify all electric light companies of any change.

73 The inspector's certificate must specify the kind, number and size of lamps which may be installed, or their equivalent in ampères. Any additional loading of wires, either in a building as a whole or in any department thereof, without the previous approval of this Exchange, or the inspector, shall be deemed a sufficient cause for the suspension of permits until such approval is secured. (*See Form F., Inspector's Certificate.*)

A New Process for Insulating Wires.

We learn from the *Centr. Blatt. fur Elektr.* that MM. Weber and Schefbauer have succeeded in preparing insulated conductors by a new process, for which important advantages are claimed. The method is said to be particularly applicable to the manufacture of double or multiple wire cables of flat section, and it effectually prevents any change of relative position in the wires. Each wire is first wrapped with several layers of paper; it is then passed through a bath of ammoniacal oxide of copper, by which the superficial layers of the paper are converted into cellulose. In this stage the wires of the cable are laid together in position, and are then passed through a rolling-mill; the cellulose layers are thus pressed into cohesion, and the whole forms one solid mass. By a mechanical device the wires are retained exactly in their true positions while passing under the rollers. The cable now again enters a bath (which performs some function not fully made known), and it is afterwards rolled a second time between hot rollers. The rollers are heated by steam, and apply a very powerful pressure. The object of the second rolling is chiefly to get rid of moisture. The cable is next cast into a bath of linseed oil at a boiling temperature, which thoroughly saturates the covering. Lastly, it passes once more through hot rollers to get rid of the excess of oil. The finished cable is very supple, and is said to be proof against damage from moisture or from ordinary variations of temperature.

Special Correspondence.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
168-177 POTTER BUILDING, NEW YORK, April 16, 1888.

Trying Train Telegraphy.

At the invitation of General Superintendent H. Stanley Goodwin, of the Lehigh Valley Railroad, a number of members of the North American Railroad Superintendents' Association, which met in this city early this week, took a trip last week on a special car over the New Jersey division of the Lehigh Valley road to examine the train telegraphy system now in daily operation on that road. All present expressed their admiration of the system. Among the prominent railroad men present were: C. S. Gadsden, President of the North American Association of Railway Superintendents; J. B. Morford, Superintendent of the Canada division of the Michigan Central Railroad; C. A. Darlton, superintendent of the telegraph system of the Richmond & Danville road; R. H. Wilbur, assistant superintendent of the Lehigh Valley Railroad; E. T. D. Myers, general superintendent of the Richmond, Fredericksburg & Potomac Railway; L. T. Myers, superintendent of transportation of the Seaboard & Roanoke Railroad; Charles A. Gilchrist, receiver and superintendent of the Fort Madison & Northwestern Railway; James Donnelly, superintendent of the New Jersey Division of the Lehigh Valley road; E. H. Goodman, of Pittsburgh, Pennsylvania; C. A. Scott, of Boston; William E. Gleeson, Charles S. Peck, J. D. Baker and Henry D. Hall, secretary and treasurer of the Consolidated Railway Telegraph Company.

The Newburgh Electric Light Company.

The recent failure of the firm of J. R. Wiltsie & Son, bankers, Newburgh, N. Y., and 5 Dey street, New York, has created no little consternation in the circles in which their business is carried on. One of its immediate results is the embarrassment of the Newburgh Electric Lighting Company, a considerable part of whose funds seem to have been devoted to other than their legitimate purposes by Mr. A. V. Wiltsie, until recently the treasurer of the company. Irregularities have for some time been suspected, and a recent examination of the books by an expert accountant, instituted at the instance of the well-known and vigilant president of the company, Mr. Ed. W. Wilson, 6 Wall street, revealed the fact that very serious deficiencies existed, and Messrs. Wiltsie & Son were called on for an explanation, which was not forthcoming. The subsequent developments have been fully described in the daily papers, and the latest step in the history of the case is the arrest of Mr. A. V. Wiltsie and Mr. John M. Pollock, the senior and junior partners in the firm. Several parties have pushed judgment against the Newburgh Electric Lighting Company, and its affairs are now in the hands of a receiver. Its judgment creditors, however, will ultimately receive the amount of their claims in full, principal and interest included. This company is an instance of what can be done by determination and judicious business handling, and in the face of two rival organizations it has, in the space of two years, under Mr. Wilson's direction, increased its plant from 3 to 300 arc lights, or their equivalent in incandescents, and has now under consideration plans for enlarging very materially the capacity of the station. The service is regular and reliable, and the lamps, which are on the Thomson-Houston system, are giving universal satisfaction.

The Wenstrom Dynamo.

This machine has lately been imported and can now be seen running at the seed warehouse of Peter Henderson & Co., 95 Liberty street, carrying 60 incandescent lamps. The Western Electric Company did the wiring, etc. Mr. B. Blum represents the machine in this country.

The Empire City Electric Company

had a little accident last week in trying to rush things on heavy orders for their Leclanché batteries. The workmen in their zeal were keeping the pot of composition, for sealing the batteries, at full boil, and the consequence was an overflow which set fire to the place and brought out the fire department. Little damage was done, however.

Union Fire Alarm Company.

Mr. G. A. Tisdale, of Cortland, N. Y., has taken the agency for the Union Fire Alarm Company of this city, and assumed his duties last week.

The Teleseme System.

The Board of Estimate and Apportionment met on April 11 for the purpose of considering the question of selecting and adopting a system of police and fire-alarm signals. The Police Board has already devoted much time to the subject. Among the systems investigated by the Police Commissioners were those of the Gamewell Fire-Alarm Telegraph Company, the Brewer & Smith Visual system, the Municipal Signal Company, the Robins Electric and Telephonic Association and the Herzog Teleseme Company. The latter system was adopted by the Police Board, but under advice from the Corporation Counsel was submitted for approval to the Board of Estimate. Its adoption involves an expenditure of $100,000. Protests against its adoption were read on the 11th from the Gamewell

Fire Alarm Company and from Pearce & Jones. The Mayor said that he failed to find any formal contract with the Herzog Teleseme Company, and the matter was referred back to the Police Board to have a form of contract prepared and sent to the Board of Estimate. Commissioner Voorhis, of the Police Board, asserts that the award to the Teleseme Company was a "job," but has not yet undertaken to prove his statement, though called upon to do so. W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
48 Congress Street, Boston, April 14, 1888.

Stoughton, Mass.

The town of Stoughton, at the recent town meeting, appropriated $1,200 for street lights. It being the sentiment of the town that electric lights should be used, a company is being formed which will put in a plant to furnish light and power.

Subway Privileges.

At a late meeting of the Boston Board of Aldermen, the board passed an order granting an exclusive franchise to H. E. Cobb, Royal M. Pulsifer and F. R. Chapman and their assigns to construct, establish and maintain through and under certain streets conduits, in and through which to conduct wires for telegraphic, telephonic, electric lighting and power communication. Included in the order is a provision that the Board of Aldermen shall determine the location in the streets through which the conduits are to pass. The parties receiving the franchise agree to furnish the city, free of all rent and charge, accommodations for all wires now owned or controlled by the city, or that may hereafter be owned and controlled by the city, and shall furnish and keep in repair such wires without expense to the city. The parties accepting the franchise shall pay to the city all the excess of their profits over 10 per cent. of their capital actually invested, and shall also allow their books and accounts to be inspected at any time by the city auditor or any person whom the Board of Aldermen may designate. The parties also agree to begin work in four months from the passage of the order, and to grant to all parties and corporations, where wires may be required to go underground, reasonable accommodations, and shall charge all persons or corporations a uniform price without favor, partiality or discrimination; all disputes to be referred to the Board of Aldermen. Should the city construct a subway in the streets occupied by the conduits, the parties agree to take up their conduits and place them in such subway at their own expense, if ordered so to do by the Board of Aldermen. After ten years the city may purchase the franchise. Nothing granted shall in any way affect the right of the Edison Electric Illuminating Company to lay its own conduits or the rights granted heretofore to any individual or company to maintain underground conduits, or the vested rights, if any, of any individual or corporation in any of the streets included in the order. The order was passed by a vote of seven yeas and three nays.

The New England Wiring and Construction Company.

The public are beginning to appreciate a fact upon which great stress has been laid by this journal from the incipiency of the electric lighting interests to the present time, and that is that no matter how fine or perfect the electric light apparatus may be, best results can only be achieved by most thorough and well-planned wiring. The proper balancing of circuits and the uniform electrical "drop" are quite as important factors in an electrical installation as the matter of having adequate current capacity for the conductors, otherwise the lights will be of varying brilliancy and life. It is, therefore, a matter of greatest importance to any one about to adopt the electric light that the construction work be intrusted only to competent parties. If this is not done, needless expense will be incurred in the work of construction, as well as in the maintenance and running of the plant. A concern whose success in the installation of large and complicated plants makes them worthy of notice, is the New England Wiring and Construction Company, of Boston, who have offices in the new Globe Building. This company is one of the oldest and best equipped electrical construction companies in the country, and has done some of the finest work to be found. Over 12,000 incandescent lights have been installed by them in New England during the last year alone. Their arc-light installations have also been referred to as thoroughly well done. The company also are doing a large amount of motor work, and have special facilities for furnishing electrical supplies of all kinds, and for doing repair work, testing, etc. They have patented and are introducing a novel and valuable invention, which is attracting attention from all directions. I refer to their multiple-switch system, by which an incandescent lamp circuit, on a multiple-arc system, may be operated from any number of points. For dwelling houses, hospitals and jails this idea has a large field for application. By it not only can an incandescent circuit be operated, but it may be used in elevators, etc., where electric motors are in use, thus dispensing with the unsightly shipping-rope, etc. They also control the sale of the "Regulator" oil cup, which is believed to be one of the best lubricators in the market for dynamos or other high-speed machinery.

Brush Plants.

The Atlantic Mills, of Providence, R. I., have one of the largest mill electric light plants in the country. They are now operating 302 Brush arcs, and have just purchased a new 45-lighter from the Brush company; with outfit of lamps. The Washburn & Moen Manufacturing Company, of Worcester, Mass., after making a very critical examination into the subject, have just put in a Brush incandescent plant of 450 lights.

The Mather Company.

The Mather Electric Company report twice the amount of business during February and March that was done during the corresponding months of last year. They have just closed contracts for lighting the Minnesota state capitol with 600 lights, the Adams Express building in Chicago with 500 lights, and the Church Green block in Boston, 600 lights. They are also preparing to light the Petroleum Exchange in New York.

The Mexican Telephone Company.

At the annual meeting of the Mexican Company last week, these directors were chosen: John D. Sargent, S. Lawrence French, Robert Colgate, M. L. Gireaud, W. H. Harrington, H. W. Gray and Charles Keveney. Mr. Harrington succeeds G. W. French, and this is the only change from the old board.

The Locke Damper Regulator.

Notwithstanding the care which the fireman may exercise in attempting to maintain an equable steam pressure in the boilers, the variations are usually such as to effect the regularity of running of the engine, with consequent effect upon the lights of central electric light stations. Hence automatic means for steam pressure regulation are coming more and more into use, and among these the Locke damper regulator, made by Messrs. Locke Bros., of Salem, Mass., claims attention on account of its simplicity and efficiency of operation. In the Locke machine the force employed in moving the damper is not dependent upon the changes of pressure, as the regulator proper has no connection with the damper, but simply actuates a valve which controls the operation of a powerful hydraulic motor, and the power of the motor is utilized in working the damper. The attainment of the best work upon this new principle requires, first, that the regulator proper shall respond without delay to every change of pressure, and second, that the valve shall move without resistance, and that its motion shall be limited to a small range.

The first requirement is met in the Locke regulator by endeavoring to keep the diaphragm continually in the same pliable condition which exists when it was new. This is done by placing the diaphragm at the bottom of a shallow well, which is constantly filled with cold running water discharged from the hydraulic motor. The second requirement is met by providing a delicate balanced valve, in which a movement of less than one-sixteenth of an inch suffices to fully operate the motor. This valve is untrammeled by connection with any working part of the machine except the lever which actuates it, and it works freely in its place without the use of a stuffing-box. As a matter of convenience, it is so arranged that it can be removed and cleaned with great facility.

Another desirable feature of this regulator must also be referred to. The regulator proper, or the "steam weigher" as it is termed, is provided with a scale pan, in the same manner as a platform weighing scale, and fitted with weights of such size that they can be conveniently handled. These weights are marked to correspond to pounds pressure, and are adjusted to multiples of 5. A sliding weight on the beam with pound marks is also provided. When the regulator is adjusted to work at the desired pressure, it is simply necessary to apply a sufficient number of weights to the pan and set the sliding weight so that the total amount shall be the number of pounds determined upon. There is an added convenience in this arrangement which may be appreciated by engineers and firemen. A universal custom exists of allowing the pressure to fall a few pounds shortly before the time for stopping the work of boilers at noon and night. Instead of reducing the pressure by the usual method of shutting the various hand dampers, the arrangement noted permits the weights to be removed from the scale pan to an amount corresponding to the reduction of pressure desired, be it 10, 15 or 50 lbs. so as to attain the object in the most convenient and satisfactory manner. In a recent test of the Locke regulator made by Mr. George H. Barrus, the well known steam engineer, the extreme variation of pressure during a one hour's run ranged from 0.3 to 1.1 lb. Another test on a plant of 1,200 h. p. showed that for a period of 45 minutes the extreme variation of pressure was less than two-tenths of a pound, and that for a period of two hours, the highest pressure was 88.50 lbs., and the lowest pressure 88.15 lbs.

The Thomson-Houston Electric Company.

The Thomson-Houston Company report the following new stations: Oswego, Kan., 500 alternating; Quincy, 100 arcs, 500 alternating; Eaton Rapids, Mich., 30 arcs; Bristol, Tenn., 50 arcs; Petersburg, Va., 100 arcs, and an increase at the following stations: Adrian, Mich., 70 arcs; Joplin, Mo., 50 arcs; Union City, Ind., 50 arcs. They also report activity in electric railway matters, and work is being very rapidly pushed in this direction. The Thomson-Houston Company have just taken four more large offices in the John Hancock building on Devonshire street, their increasing business in motors and electric railways making this addition necessary. One of the new offices is occupied by the International Company and the department of advertising, the others are occupied by the Street Railway and Motor Departments. They are lighted by incandescent lamps from the Thomson-Houston alternating system operated by the Boston Electric Light Company.

It is evident that the foreign business of the company is greatly on the increase, as it is shown by the departure of four of the company's staff, who sailed on the Pacific mail steamship "Colon," Wednesday, April 11, from New York. They were: Messrs. C. B. Davis, who goes to Guatemala; C. W. Grant and W. C. McEntee, who go to Panama, and P. Burbank, who goes to Lima, Peru.

Mr. H. C. Spaulding, of the motor departments, has been in Banger, Me., during the past week, and reports the prospects for motor service there to be very good indeed. The reports of the performance of the Thomson-Houston motors at Lowell, Providence, Haverhill and New Haven are very encouraging.

The Rogers Auxiliary Fire Alarm.

Superintendent of Public Buildings Tucker, in making a report to Mayor O'Brien of the condition of the public schools of Boston, closes with the following as to the adoption of the Rogers auxiliary fire alarm as an additional safeguard for the school children against fire or panic. I expect to yet see the Rogers auxiliary in all the public school buildings throughout the State, as no community can afford to be without every possible protection for its children when under the public care: "I desire to add that I have placed on our school buildings an additional safeguard against the spread of fire, it being the auxiliary fire alarm whereby the fire department is at once notified by special wire from each building in case of fire or panic, bringing the firemen immediately to the building to aid the teachers. Twenty-five buildings have been supplied with this appliance, and during the coming summer I shall endeavor to furnish as many more with the same improvement where most needed." The improvement has the approval of the fire commissioners.

Synchronous Time.

The Synchronous Time Company, through their licensees the Boston Electric Time Company, are rapidly introducing their system in this city. They have several hundred clocks already in operation giving the most satisfactory results. During the heavy storm of last month the merits of this system were clearly demonstrated by the fact that although the wires were down in all directions, the synchronous clocks were in no way disturbed. It is proposed to utilize the district messenger wires in the residence districts, it having been demonstrated as perfectly practical to operate these clocks on district lines without in any way interfering with the district work.

New Electric Light Factory.

The Loomis Electric Manufacturing Company have vacated their factory in South Boston, Mass., and moved to a larger and much better equipped building in or near Amsterdam, N. Y.

A Reading at the Boston Electric Club.

Mr. W. O. Webber, the well-known engineering expert, has accepted an invitation to read a paper before the members of the Boston Electric Club, on Monday evening, April 23. The subject will be entitled "Advantages and methods of testing and inspecting all kinds of supplies."

A Veteran Enterprise.

The Redding Electical Company, 30 Hanover street, Boston, is enjoying a more prosperous trade to-day than at any time during the past two years, and on certain specialties of its varied lines of electrical goods a large demand is being made.

The Hartford Dynamic Company.

Although scarcely a year in existence, the Hartford Dynamic Company is already well known. Wherever steam plants have been put in by this company its work and the equipment furnished has proven satisfactory. It makes a specialty of the excellent Russell engine.

Silk Braid for Filaments.

Mr. A. A. Ziegler, 109 Court street, Boston, is now prepared to supply manufacturers of incandescent lamps with all kinds and sizes of silk braiding cleaned by a new process, being perfectly free from gum and all impure substances. Those who have used this silk braid have found it a valuable adjunct in making filaments for incandescent lamps.

A Handsome Catalogue.

The attractive and valuable catalogue recently issued by the Crosby Steam Gage and Valve Company has just been received at this office. It contains descriptions and illustrations of the company's products, most noticeable being the Crosby improved steam gage, steam engine indicator, pop safety valve and single bell Chinese whistle, all of which are in use to-day in a number of local electric light stations and plants. A copy of this catalogue will be furnished free on application to any manager or superintendent of electric light stations.

Lights for Bridgewater.

At a special meeting on April 9 the committee appointed to consider the matter of lighting the streets reported. The meeting voted to contract with some electric light company for $1,000 worth of arc lights, and appropriated money for the same. Steps have already been taken to form a local company, and one will be incorporated in a few days.

New Electric Light Installation.

Messrs. Claflin & Kimball, of Boston, the New England agents of the Mather Electric Company, have their force at work installing a 500 incandescent electric light plant in the Church-Green block on Summer street, Boston.

Personals.

Mr. George T. Manson, of New York, representing the Okonite Company, favored this office with a visit last week.

Mr. Henry D. Stanley, of the Bridgeport Brass Company, was in this city several days during the past week and called at this office.

Mr. Morris W. Mead, Superintendent of the Fire-Alarm Telegraph, at Pittsburgh, Pa., was on a business visit to the "Hub" last week. Before leaving the city Mr. Mead visited the Boston Electric Club rooms and this office also.

Mr. Thos. T. Robinson, of the Thomson-Houston Electric Company, has closed contracts with the Narragansett Electric Light & Power Company for the installation of their plant, consisting of 2,000 incandescent and 50 arc lights, also with the North Shore Electric Company for the installation of their plant, consisting of some 150 arc lights and 1,000 incandescent.

Mr. Arthur S. Beves, the treasurer of the Sprague Electric Railway and Motor Company, of New York, was on a business visit to Boston last week. During his stay in the city he was the guest of Messrs. Sawyer & Blake, and before returning to the Metropolis he enjoyed a trip on the Sprague electric car, which is now undergoing experimental tests by the West End Railroad.

Mr. Charles J. Van Depoele, so widely known throughout the electrical field in connection with electric railway and electric light enterprises, has arrived in Boston, and probably will remain a permanent resident in this section. Mr. Van Depoele's electric railway interests now being allied with the motor and electric power systems of the Thomson-Houston Electric Company. He will have an office at the Boston headquarters and one also at the Lynn factory of that company. W. I. B.

AMESBURY, Mass.

The Amesbury Electric Light Company have within the last few months made extensive improvements in their plant. They have now moved their dynamos from their old engine-room into a room fitted up for the purpose, nicely sheathed overhead and sides with molded oak wainscoting around the entire room. This room is 40 × 43 feet, high posted, with a four inch shaft 35 feet long, running through the centre belting to dynamos on each side. There are at present three 30 light Thomson-Houston dynamos running. Each dynamo sets on two hard pine timbers bolted down to a cement floor underneath the wooden floor. Two of these dynamos are used for street lighting, and the other is nearly taken up for commercial lights, both arc and series incandescent. The dynamos are now driven by a pair of Exeter slide valve engines, 11 × 24 cylinders, located in another room, and running with two long belts.

It is proposed to make an addition to this dynamo room of 20 by 26 feet, in which will be placed a pair of long-stroke automatic engines, capable of developing three hundred horse-power. Each

engine will be connected to a pair of belt wheels, one belt of which goes to the dynamo shaft and the other to a clutch pulley on the mill shaft, by a clutch coupling, so that in case of accident to either engine the other one can do the work without shutting down the main belt wheels from 6 in the morning to 12 at night. They will also increase their boiler-room and boiler capacity by putting in a large boiler. It seems quite probable that the Amesbury & Newsburyport Horse Railroad Company will adopt electric motors of the Thomson-Houston type on their new road from Amesbury to Merrimac, which is expected to be in operation by July 1. The current for this road will probably be furnished by the Amesbury Electric Light Company, and if the road proves successful they will probably equip their entire line to Newburyport. In doing this, the Newburyport Company will furnish a portion of the current. The working of this line will be watched with interest.

The Amesbury Electric Light Company expect during the coming summer to put in a 500 light alternator for supplying incandescent lights for churches, houses, stores, etc. They have also made a proposition to the town of Merrimac to furnish city lights there, but no action was taken at the last town meeting, though most of the business men of Merrimac think it cheaper to operate from Amesbury than to operate a small plant in Merrimac.

The company own, let and furnish power in a large brick building 200 feet long by 50 feet wide, 3 stories high, situated some little distance from the centre of the town, near tide water, and have a side track from the B. & M. Railroad. It is proposed to build a wharf the coming summer, so that coal may be received by water or rail. The upper floor is let with power to a carriage wood-working establishment. The second floor is used for the manufacture of patent flooring, of which the electric light company own the patents; and also for the manufacture of refrigerators. The company's office is also on this floor. On the first floor there is a machine shop at one end and a planing mill at the other end. The boiler, engine and dynamo rooms of the company occupy the rest of this floor.

They also own a wooden building, 70 × 30 feet, three stories, which is let without power. They also have a large piece of land on which they propose at some time to build and put in power for a shoe shop if tenants can be secured. The large fire of the carriage shops, etc., on April 5, destroyed a considerable portion of their circuits and they were obliged to take off their commercial lights nearly as soon as the fire started, so that no one would be hurt by falling wires, they having wires running over a few of the threatened buildings which were afterward burned. The fire burned seven poles and destroyed five lines of wire that run on them. By hard work the company had their commercial lights and all but twelve of their street lamps running the next night. The officers of the company are Charles Drummond, president; Charles Goss, superintendent and treasurer; E. W. Goss, superintendent of construction and electrician.

LOWELL, Mass.

The Middlesex Electric Light Company, of Lowell, have about completed the improvements to their station commenced last fall. The business of the company since its organization has steadily increased, making an extension of facilities an imperative necessity, and last season an adjoining lot of land, about 90 by 25 feet, was purchased and building operations commenced thereon Oct. 5. A very neat and substantial brick building, two stories high, with spacious basement, covering the lot, was erected and fitted with machinery of the most approved patterns. There are three heavy steel tubular boilers of 100 h. p. each, nominal, fitted with several novel arrangements for the feed and blow-off and facilities for cleaning out the tubes. A branch track from the B. & L. R. R. runs directly back of the fire room, and coal from the cars is dumped in a space at the end of the room, leaving but little labor for the firemen in that direction. A new double Harris-Corliss engine, with cylinders 18 × 42 inches and fly-wheel 17 feet diameter by 32 inches face, supplies the power. The exhaust steam passes through a new pattern Wainwright feed-water heater. The feed pump is a Dean, of Holyoke, fitted with an Ashton relief valve, and the injector is a Penberthy. The engine is neatly and substantially finished, and is fitted up with work bench, desk, closets, wrench board, lockers, etc., for the convenience of the engineers. In the second story are located the dynamos, arc and incandescent, all of the Thomson-Houston system, which are driven from counter-shafting, fitted up with the Hunter friction pulleys. The main driven pulley, belted from the engine, is on a cast steel sleeve or quill, on one end of which is a Hunter friction cut-off coupling connected with the main driving shaft running through the quill, by which means the power from the new engine in the room below can be applied or cut-off easily from the main shaft, which extends across the second story of the older part of the station, and is connected by a similar friction coupling arrangement with another engine in the lower story of that building, of about same capacity as the new one, enabling either or both of the engines to be used as wanted. The new engines and boilers were started up Jan. 9, and are now furnishing power for eleven arc light dynamos and one incandescent dynamo, all of the Thomson-Houston system, with a capacity of about 400 arc and 300 incandescent lights. Power is also furnished to six Thomson motors of about 25 horse-power in the aggregate. These motors are used in printing offices to run presses, the *Daily Courier* and *Evening News* being printed with the power furnished, and other newspapers will soon be furnished with this convenient and satisfactory power. There are several motors in use in stores and factories running elevators, etc., and almost daily applications for more are secured, showing that from that source the company can have all the patronage desired. Finding the arrangement of the additional plant lately added to work so satisfactory, the company has rearranged the older portion of the works to correspond with the new section, by resetting the boilers, introducing the new system of piping, etc., and turning the engines around to run in connection with the new one in the way before mentioned. For the day incandescent system an Armington & Sims engine of 50 horse-power is employed, in addition to the larger engines, which at present are used only at night. This small engine will be used as an auxiliary for the time being, but will soon no doubt have to give way to a larger engine. It is being placed upon a substantial foundation in the older engine room. Formerly several of the smaller engines were employed, but all except this one have been disposed of, as it has been found by experience that it is much more preferable in the way of economy and perfect regulation of speed to use the large engines when arranged, as in this plant, with the friction clutches and pulleys. A recent test shows that less than ten per cent. of the power developed by the engine is lost in friction of shafting and pulleys, thus disposing to a great degree of the objection made by some, to the method of using large engines, concentrating the power instead of sub-dividing it. In reference to the quality of lights furnished, it is the universal comment of those who visit the city that are familiar with the subject, that the electric lights in Lowell are fully equal to those of any city in the country, both as regards to brilliancy and steadiness.

The brick work of the addition and renewal of the older part of the station was very acceptably done by Foss & Burt; the wood work by G. W. Bagley and E. G. Baker; steam and water piping by L. H. Jones, and the boilers were furnished by Scannel & Wholey, all of Lowell. The plan of the new addition and arrangement of the older portion originated with the manager of the company, J. Y. Bradbury, and he with the president, J. W. Fifield, and Treasurer John H. McAlvin, constituted the building committee in charge of the improvements. The details were put in charge of Jas. H. Wilson, mechanical engineer, who furnished the drawings and superintended the construction. No effort has yet been made to increase the business of the company in the way of solicitation, as the calls for service have been always in advance of the facilities possessed, and with the present increase in the plant, the company will have to utilize all its capacity to supply the existing demand. The company is in a very prosperous condition, and at a meeting of the directors April 9, the regular semi-annual dividend of three per cent. was declared.

WORCESTER, Mass.

The electric light company here was formed and began operations in December, 1884, putting in at that time four arc dynamos and furnishing 138 street lights. The public were so well pleased that the demand for more light was made, and as the quarters then occupied proved unequal to the demands of the business, a new building was put up on High street, and the number of dynamos has increased to 14, and the number of street lights to 400. Incandescent lighting was introduced by the company some two or three years ago, and they are now running three incandescent dynamos, furnishing about 800 lights. The plant has proved satisfactory in every respect, and is a success.

The electric power station was established two years ago. Its growth has been slow, owing to numerous difficulties met with in the way of privileges to run wires, etc. But the patrons it has speak in the highest terms of it, and there are many others who are wishing to adopt it as soon as the necessary arrangements can be made. It is furnishing something over thirty horse power at present. Experiments with electricity have been made on the "dummy" road, and cars will probably be run by that means during the summer.

Mr. H. H. Bigelow has plans for an immense electrical building in the centre of the city, and also for an electric road from Union Station to Main street, in connection with his plan for a large store building on the old rink site. The manufacture of electrical apparatus has never been extensively carried on here. The Whitcomb Machine Company have recently started in this line, and there is every indication that they will be successful. They have recently been experimenting with a small house dynamo, which, if successful, will prove quite an addition in this department.

Messrs. Reed & Page are among the largest dealers in electrical goods and have won a wide reputation. They deal in every article to be found in their line. They have recently taken a store on Main street, which has proved a good move, as many of our people were before ignorant of the existence of such a concern. They are doing a great deal of work all over New England. There are several other smaller dealers who are doing a good business, and the prospect for the growth of the business in this vicinity is excellent.

Another branch of the business is that of the manufacture of non-acid medical batteries, which is carried on by E. J. Leland, one of the oldest electricians in the place, and who has brought out many valuable features in this field. His battery has some most valuable points. It is being most favorably received and is receiving the indorsement of the profession. He has also several forms of burglar alarms possessing novel features.

NEW BEDFORD, Mass.

The local gas company are now stringing wires for incandescent lights, using the Westinghouse system. The Edison Company are now looking into the matter of a complete arc lighting system, having all the boiler and engine power needed for the purpose.

BANGOR, Me.

The Western Union Telegraph Company have moved from the second to the ground floor of the building in which they have had their office for the past seventeen years. The increasing business of the office made a change necessary, as there was not room on the second floor to accommodate the new wires now being strung both east and west. Since the Western Union first opened an office here nearly forty years ago they have moved five times. The various managers of the office during these years have been Wm. B. Clumb, Frank H. Palmer, J. S. Bedlow, Suel Smith and the present manager, Chas. E. Bliss, who has held the position for over thirty years. The moving of the cable quad, duplex and single repeaters and the other apparatus was done under the supervision of Mr. J. F. Temple, the chief operator, who has accomplished it with skill and neatness. During the Stain-Cromwell trial an average of 25,000 words of press was sent (per day) from the office.

I learn from to-day's paper that Eastport, Me., is to have an electric light and the plant is to be put in very soon.

There is a strong movement in Old Town for the electric light, and Mr. Fred S. Palmer, of Portsmouth, N. H., formerly superintendent at the station in this city, who has been visiting at his home in this city, has been at Old Town consulting with the citizens in regard to the movement. It is very probable that but a short time will elapse before the glare of the carbon will be seen about the streets of Old Town.

The electric light company, the papers say, is thinking of adding to its already effective service by putting in a motor circuit about the city, so that all who wish may have their machinery driven by electricity. Mr. H. C. Spaulding, of Boston, of the Thomson-Houston Electric Company, is in the city making a canvass of the different establishments which would be likely to adopt this method of motive force, and seeing what encouragement will be given the introduction of the system. If sufficient encouragement is given, the company will have the motor circuit in operation by May 1.

AUBURN, Me.

The first electric motor in Lewiston and Auburn has been placed in the *Lakeside Press* in this place. It was placed by the Lewiston & Auburn Electric Light Company in Auburn. The motor is of 5 h. p., of the Thomson-Houston Company's make. It is used for running a large two-revolution Campbell printing-press, a half medium Golding jobber, on one floor; a dynamo for steel facing copper plates, and a saw and routing machine upon another floor. The machine provides, the concern state, the most perfect possible power. A person can learn in an hour to care for the machine, start it, stop it, and keep it in perfect running condition. Mr. F. H. Allen, the secretary, says that they estimate that when all of their machinery is on, it requires a full five h. p. machine to carry it. They have tested this motor by starting it up with the machinery all on, and it goes off with as great readiness, apparently, as though it carried only the shafting. Mr. Allen has been familiar with electric motors for several years, since they were first introduced in the city of Boston, and he made the request that when the company was ready to place motors in Lewiston and Auburn that he have the privilege of starting the first one. Permission being readily granted, he now freely says that the perplexities and difficulties attendant upon the starting of a new enterprise and the establishment of machinery about which people in general know comparatively little, have been reduced to a minimum; in fact, "the motor from the start has done the work to their complete satisfaction."

LEWISTON, Me.

There are in Lewiston and Auburn three central electric lighting stations—that of the Lewiston & Auburn Electric Lighting Company, that of E. W. Gross and the plant recently set up by the city of Lewiston for street lighting. The plant of Mr. Gross is of the American system, and an arc circuit has just been strung for it. When fully under way it will also include motor circuits. Mr. Gross has a fine water-power privilege on the Little Androscoggin. The Lewiston street lighting station began running on January 6 at the water-power pumping station of the city waterworks, using the American 50-light dynamos. There are now in use 92 lights, which burn all night and every night, regardless of lunar eclipse or splendor. These lights are in two circuits, one 8 miles long and the other about 15.

Besides the above, Ara Cushman & Co. use in lighting their shoe factory a Thomson-Houston incandescent plant of 800 lights, enlarged last fall from 600. The Bates mills have a plant of 1,015 Edison incandescent lamps of 20 and 24 c. p., and 38 Arnoux-Hochhausen arc lights.

AUBURN, Me.

Success is the proof of merit, and the Lewiston & Auburn Electric Light Company believe that they have proved conclusively that water-power is far superior to steam-power for running electric light plants, not only in point of economy but in giving more satisfactory results.

This company have a complete Thomson-Houston plant, from dynamos to carbons. The station is a large, substantial frame building, 40 by 100, situated on the bank of the Little Androscoggin River, one and one-half miles from the centre of the city, where a stone dam has been built.

The basement contains the main shafting, which rests on 15 brick piers, making it very steady. This is divided at the centre by a Hunter cut-off coupling, and besides the fixed pulleys there are a series of loose pulleys running on an arbor by sleeves attached to separate hangers. This arrangement relieves the shafting of all strain when the dynamos are not running. At the end of the basement is a broad stairway leading down to the wheel-house. There are two Holmes water-wheels, each rated at 250 h. p. These are attached to the main shafting by two Hunter clutches, permitting the use of one or more wheels as desired. The gate is regulated by a Gillespie governor, which does its work admirably. A belt 75 feet long, 4 feet wide, made by the Page Belting Company, of Concord, N. H., connects the jack shaft and the main shaft. On the main floor is the dynamo room, in which are 5 arc machines and a 60 h. p. generator for motors, the belts running through the floor to the shaft below. Space has been reserved for two 500-light alternating machines which are in process of completion at the factory, and also for two more generators. On this floor are the testing and store rooms. The building is heated throughout by steam, and wired for electric signals. This plant is one of the largest and most complete in New England, and the company are doing a flourishing business.

EASTPORT, Me.

The Eastport Electric Light Company has been organized, the principal parties in it being Gen. S. D. Leavitt, of Eastport; N. B. Nutt, G. Alexander, and John Post, Jr., of Boston. It will have a plant of 50 arcs and 500 alternating incandescents, all of the Thomson-Houston system. The engine will be an Ide automatic of 100 h. p. The boiler will be a steel of 150 h. p., with Weitmeyer setting, Wainwright heater, Worthington steam pump, and Gresham injector.

ROCHESTER, N. H.

This spring the electric light plant will be all remodeled, wires, station, etc. A change is also to be made from the present system to that of the Thomson-Houston Company, which is confidently relied on to give general satisfaction.

PORTLAND, Me.

At Bar Harbor, the Bar Harbor Illuminating Company have 2,000 incandescent lights in cottages, hotels stores and offices, and new orders are coming in every day. They also have 30 arcs running in the summer. About 600 of the incandescents run through the year. At Bucksport, Mr. G. H.

Grant is putting in a 300-light incandescent plant. He is also starting a factory there for the manufacture of cleats, rosettes, bell-boxes and everything in the wood-working line demanded by electrical people, wood and help being very cheap in that locality. Both of the above lighting systems are the Sawyer-Man incandescent and Thomson-Houston arcs.

At Ellsworth, there is an 800 light Brush-Swan plant. At Mathias a Brush-Swan plant has just been ordered. It is understood that a plant is to be put in at Cherryfield.

GARDINER, Me.

P. C. Holmes & Co. have have recently completed the Lewiston & Auburn Electric Light Company's station, putting in two Holmes turbine wheels and the shafting-gears, pulleys, etc., necessary for driving eleven dynamos, and the plant is running very nicely and giving the best of satisfaction. They are now at work on the wheels for the Kennebec Light and Heat Company at Augusta, which company will furnish light and heat for Augusta, Hallowell and Gardiner. In addition to the above they have set a number of wheels for various parties, and are at present building seven of them for the Edwards Manufacturing Company, Augusta. All of the wheels running have exceeded their anticipations.

BRATTLEBORO, Vt.

The telephone exchange at Brattleboro has, it is said, never enjoyed such prosperity as it does at the present time. It was organized June 1, 1881, and has grown ever since. It has just added a new Western Electric board of latest design, which works admirably. Fifteen new subscribers have been added since the beginning of the year, though new business is not solicited. The rates are $30 per year. There are 175 subscribers to the central office, and the exchange is in connection with nearly every town in Windham County. About 25 private sets are also in use in the town. The pole lines are of chestnut, and the whole plant is in excellent shape.

MONTPELIER, Vt.

The Standard Light and Power Manufacturing Company was started here about a year and a half ago with 25 arc and about 150 incandescents. It had some hard fighting to do at first, but at present is going along very nicely. It now has in use 40 arc lights and 1,017 incandescents, including six in series, all under contract. Its town lighting is held under a five-year contract; all the others are on yearly contract, with the exception of the Pavilion, where two arcs and 208 incandescents have been taken for three years. All the customers seem well pleased. All the ground is not yet covered, however, and the company will soon be in the market for new dynamos, engines and boilers, to meet the increase before the fall.

DOVER, N. H.

On July 23, 1887, a few lamps were started on the streets of Dover on exhibition; on Nov. 18, 1887, 63 arc lamps illuminated the streets, and at the present time there are 100 street lamps. Nearly all the stores, halls, offices and business places of the city have electric lights, making Dover one of the best illuminated cities in New England. Under the able management of A. D. Richmond, superintendant, and F. S. Austin, chief engineer—both young men—no accidents whatever have occurred, and things are going on smoothly as can be. The system is the Thomson-Houston. The plant includes four 50-light arc dynamos and two 400 incandescent dynamos. The steam power plant was furnished by the Jarvis Engineering Company. It comprises three high-speed Armington & Sim engines.

GREAT FALLS, N. H.

Mr. H. S. Burgett, of the Thomson-Houston system of Boston, has taken a contract to light the streets and give all kind of lights to meet the public demand. It is believed that the people here will be as well pleased as they are in the sister city of Dover, where they are more than satisfied.

PORTSMOUTH, N. H.

The electric light plant in this place is working very satisfactorily under the superintendency of Mr. F. S. Palmer. At the time that Mr. Palmer took hold of it the station was running behind, but he proceeded to put in the Thomson-Houston system of arc lights last September, and purchased of the same company a 500-light alternating machine, which was started up on Oct. 5 with 270 lights. The capacity of the machine was filled up in two months. Another 500 lighter was ordered in January, but the rush of business prevented putting it in operation before April 1. The plant is growing in popularity every day, and the company hopes to have 1,000 incandescents in use by Sept. 1 It is now running also 90 arc lights.

CONCORD, N. H.

In spite of all the opposition that they have had to encounter, the Concord Electric Light Company, Stevens & Hammond, managers, have gained steadily every month. They now have 82 commercial and 18 street arc lights, run from two Thomson-Houston machines. They have had applications for some 15 more lights, but have held off from installing them, on the ground that they did not care to purchase another dynamo unless they could contract for 25 lights; and the parties who want the lights are securing for them the number required, which is an excellent indication of the efficiency of the service and the popularity of the light. The company have three engines set, capable of running 250 arc lights. At present there are not any incandescents in use. A general enlargement of the plant is looked for this summer or fall, and the managers say that they will then be ready for any demands that may be made upon them for service. It is said that the city has not used as many lights as might have been expected, owing to the influence of the gas company, but in time the superiority of the arc will speak for itself.

CLAREMONT, N. H.

The pioneer installation of electric lighting in this part of Western New Hampshire was made in the fall of 1886 at the works of the Freeman & O'Neill Company, manufacturers of interior house finish and office fittings in all woods and designs. Their plant is the Westinghouse system of 75 lights capacity and was furnished by Westinghouse, Church, Kerr & Company, New York. A uniformly good light is obtained each day to the closing hour, a matter very essential for the fine and elaborate work turned out at that establishment. The next installation in point of time was made by the Sugar River Paper Mill Company, J. T. Emerson, agent. This is also the Westinghouse system and consists of 75 lights with 10 horse-power engine, making a complete independent plant. The manufacture of paper is carried on continuously at the Sugar River Company's mill, and the addition of the electric light to their superior facilities augments them. The lighting system for this company has been in uninterrupted operation for nearly a year.

In December last the Claremont Electric Light Company was organized, and soon after began operations to equip their stations and construct the street lines. The capital stock is $12,000 and the officers are: Ira Colby, president; E. J. Penney, treasurer; John L. Farwell, Jr., secretary. The contractors were the Edison United Manufacturing Company, who furnished the dynamos of the Edison system. Their capacity is 450 lights of 16 c. p. The New England Wiring and Construction Co., of Boston, built the street lines and wired the buildings complete, ready for installation of the station, which took place in February, and has been in successful operation since. The town annual meeting in March appropriated $1,200 for lighting the streets and public buildings for one year. There are now 30 street lights of 50 c. p., and the number will be increased. The light is to be used in the new Trinity chapel and probably Trinity and other churches. The outlook for electric lighting in Claremont is very encouraging and, undoubtedly, the station will be enlarged at no distant day.

PROVIDENCE, R. I.

The Narragansett Electric Lighting Company have added to their station a 200 h. p. Armington & Sims engine and two 50-light Thomson-Houston machines. They have also introduced very successfully series incandescent lighting with lamps of 32 and 65 c. p., and over 100 of them are now in use. They have also bought 60,000 feet of land with the intention of building a new station at no very distant day. Mr. F. I. Marcy is the president, Mr. D. A. Peirce, treasurer, and Mr. V. A. Thomas, superintendent.

HARTFORD, Conn.

The Hartford Light and Power Company have now put in a 50-arc light Waterhouse machine, and have increased their incandescent and power business. They now furnish 50 arc lights, 4,500 incandescent and 50 h. p. in motors. They are running Mather, Eddy and Sprague motors. These motors are used for various purposes—ventilating fans, printing presses, cash carrier systems, coffee mills, type-setting machines, and the various kinds of apparatus used in machine shops. Their business is steadily increasing, the orders come in faster than they can do the work, and they are always from 400 to 500 lamps behind orders. Mr. D. Henney is president and treasurer, Mr. G. L. Best secretary, Mr. W. R. White superintendent of the electrical department, and Mr. J. Henney superintendent of the steam department.

MERIDEN, Conn.

The leading electrical item of interest at present is the new electric street railway. The road was built a year ago, and horses were the motive power first used, but this last winter a fire broke out in the company's barns and almost everything they owned was destroyed. There were 15 cars and about 90 horses burned. The company decided to start again as soon as it was practicable, but thought they would look into electricity before adopting horse-power again. Several officers of the company visited a number of electric roads, and being very favorably impressed with their working, it was decided to use electric power on the Meriden road. The Daft and other companies figured on road, I believe, but the contract was finally awarded to the former. The street railway company operate three lines, some four or five miles of track in all.

MIDDLETOWN, Conn.

The Schuyler Electric Company have just completed an arc and series incandescent plant for the Mission Ridge Land Company, Chattanooga, Tenn.

The Knoxville, Tenn., Schuyler Electric Company have recently increased their plant by the addition of 40 improved Schuyler double lamps, and still the cry is for more.

At a recent meeting of the Norwalk and South Norwalk Schuyler Electric Light Company a quarterly dividend of 2 per cent. was declared, payable on and after April 15. This company will largely increase their plant this spring. Norwalk is one of the best lit cities of its size in New England.

NORWICH, Conn.

During the past year but little change has been made at the station of the Norwich, Conn., Electric Light Company. The officers are the following: Hugh H. Osgood, president; P. C. Johnson, secretary and treasurer; G. W. Phillips, superintendent. They have now been running three years. The station comprises one 50 h. p. Armington-Sims engine, one New York Safety 75 h p., one Bigelow boiler 150, one Pittsburgh 60 h. p., one 400-light Thomson-Houston incandescent, one 45 arc and one 38. They have running 307 incandescent lamps, and the full capacity of both machines on arcs, 21 of which are street lights. The plant is increasing slowly but steadily. The company are in hopes of getting a double amount of street lighting the coming season, as they are giving great satisfaction. Everything has run smoothly up to the present time without the slightest accident.

WINSTED, Conn.

The Winsted Gas Company, R. E. Holmes, president, which for nearly two years has operated by steam power a 45 light arc 1,200 c. p. and 300 light incandescent 16 c. p. plant of the Brush system, has recently purchased a fine water privilege about five miles from town, where it has erected a commodious station, fitted with a 21-inch horizontal turbine wheel, manufactured by the Holyoke Machine Company, and capable of furnishing 250 h. p. In consequence of the remoteness of the station, the direct low tension incandescent system was not tried there, but a 500 light 16 c. p. plant of the U. S. Electric Lighting Company's high tension alternating current system substituted. In this system the potentials are 2,100 and 110 volts in the primary and secondary circuits, respectively. The primary circuit is 10 miles long and built of No. 1 copper wire, B. & S. gauge, calculated for a loss of 4 per cent., with 500 16 c. p. lamps in circuit, which is very suggestive in comparison with the size of wire in the old circuit used with the direct low tension system for 300 lamps, which consisted of two No. 0000 wires, although the last lamp in circuit was half a mile from the station. Mr. Holmes carefully investigated the various systems of distribution by high tension alternating circuits before purchasing, and was convinced that the simplicity of the apparatus and ease of handling the United States Company's system rendered it most suitable for his purpose. The gas company has further increased its capacity by the purchase of another Brush 45 light 1,200 c. p. arc dynamo with necessary lamps for inside lighting, both incandescent and arc, and it is probable that in the near future power will be furnished by electric motors.

PUTNAM, Conn.

The Putnam Electric Light Company, operating a Thomson-Houston 45-arc machine, and the same company's alternating machines, have reached nearly the limits of their present plant, and are anticipating putting in more power. George E. Shaw, treasurer, reports the plants running very smoothly. Putnam was the first town in Eastern Connecticut to light its streets with the electric light. It has water-works, and is a very enterprising town.

BRISTOL, CONN.

The greatest electrical development seen here is that in electric lighting. The Bristol Company started about two years ago with 14 arc and 30 16 c. p. incandescent lights of the Thomson-Houston system. They leased power from Mr. Eaton for the first nine months. They now have a plant of their own with a capacity of 60 arc lights and 400 incandescents. The growth which has thus been so steady up to the present time continues. The company are now putting incandescent lights into the three principal churches, some 30 or 40 lights of 20 c. p. in each church. The owners of the Gridley House Hotel contemplate putting in an isolated incandescent plant in the fall. The E. Ingraham company have erected a large factory to which they have added a 500-light Mather dynamo. All this work has been done in a place of less than 6,000 people, where three years since nothing was practically known about the electric light. Southington, a small town adjoining, is to put in an incandescent plant for private and street lighting. Bristol, by the way, is the home of the J. T. Case engine, which, I think, will take a front rank in electric work. It runs excellently coupled direct to the dynamo.

NEW HAVEN, Conn.

At a recent stockholders' meeting of the Standard Electric Time Company, of Waterbury, Conn., it was voted to increase the capital stock from $15,000 to $25,000, with which they will greatly improve their manufacturing facilities. This company was organized only about a year ago and is achieving great success with the Warner system of electric time. This system is quite different from any other, and is, it is said, giving perfect satisfaction wherever it is in use. The oldest plant of this system is at Ansonia and Birmingham, Conn., where it originated, and where it has been in operation for over four years. Other plants are in operation at Waterbury, Seymour, New Haven and Rockville, Conn., and Kansas City, Mo. Large plants are being constructed in Hartford and Middletown, Conn., and the system is to be introduced into several other places as soon as apparatus can be built for them. This company also controls Warner's patent electric gauge, that is now so popular with telephone inspectors and battery men. They have been unable to supply the demand for the pocket size for some time. An electric light gauge will soon be put upon the market to be used in central stations, a specimen of which was exhibited at the late convention in Pittsburgh, and was greatly admired by all who saw it. The officers of this company are: John W. Hill, president; Chas. S. Chapman, secretary and treasurer; Chas. D. Warner, general manager; and George M. Chapman, assistant manager. The office of secretary and treasurer will be moved to New Haven May 1, where the general manager's office is located, when their general facilities will be greatly increased, as already stated above.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
39 South Tenth Street, Philadelphia, Pa., April 14, 1888.

Reading, Pa.

A special dispatch from Reading relates a story which brings the value of electric lights into prominence. The Consumers' Gas Company, having obtained an injunction against the consummation of a contract with the Wheeler Reflector Company, of Camden, N. J., for lighting the streets, and Councils being unable to remedy the matter by making a new contract owing to the deadlock in the Select Branch, the outlying districts were put in total darkness. The business portion, however, was illuminated by electricity, and in this instance, at least, it was proved that the wisdom of the merchants of that town was not amiss when they provided themselves with electric lights as well as gas.

Media, Pa.

A number of the enterprising citizens of Media, Delaware County, have started a movement to have an electric light plant erected in that place at an early day, the idea being to have the light both for streets and dwellings. It is estimated that a plant will cost about $10,000, and half of this amount has already been subscribed. Frank M. Brooke, Henry C. Howard, Prof. Swithin, C. Schortlidge and Hunter Brooke are the leaders of the movement.

Pittston, Pa.

Among the charters granted by the Secretary of State this week was one to the Citizens' Electric Illuminating Company of Pittston, Pa., which is to begin business with a capital stock of $40,000.

The Keystone Bank.

The Keystone National Bank of this city, for the use of which a magnificent building is now being erected at Juniper and Chestnut streets, have decided to place two 50 h. p. Harrison safety boilers in the structure. Absolute safety, economy of fuel and general efficiency were the features most carefully sought after for this

plant, and the Harrison safety boilers were adopted after a most thorough examination into the merits of all the different makes. The Harrison people report an excellent business, a condition of affairs which is certainly well merited.

Standard Glass Works.

The Standard Glass Works, 1207 Arch street, of which Mr. Wm. Kuemmerle, Jr., is the manager, are doing an enormous business in the manufacture of incandescent bulbs. The firm devote considerable attention to this particular branch of the electrical field, and their success has been earned after several years of experiment and the expenditure of a large amount of money in bringing the matter to a successful point. In the manufacture of bulbs an unusual degree of care is necessary, not only in the preparation of the ingredients, but also in the blowing, and, having overcome many obstacles, the Standard people are now rewarded with more orders than they can conveniently fill, even though they have been running their works night and day for some time past.

Pearl Buttons.

The Australian Pearl Works of this city are kept busy with the manufacture of pearl buttons for all kinds of electrical apparatus, such as pearl pushers, gas lighting switches, etc. Pearl, on account of its ability to withstand the effects of climatic changes, is being more generally used than any other substance, and the working of it has brought forth a new branch of the electrical field.

G. W. Shaw & Co.

The house of George W. Shaw & Co., Limited, the well-known manufacturers of artistic gas and electric light fixtures, and art metal work of all kinds, are now engaged upon what is believed to be the most expensive and artistic set of combination gas and electric light fixtures ever made in this or any other country. They are intended for the new palatial residence of millionaire Clark, of St. Louis, and before being shipped will be exhibited for a short time at the salesrooms of the firm. The chandeliers have an equal number of gas and electric light burners, and are gotten up in all the different metals, including gold and silver, in every conceivable shape and style, the efforts being directed to having them different from anything yet constructed. The firm of Shaw & Co. have a national reputation for artistic work, but this order, owing to the fact that no limit being placed as to expense, enabled them to far surpass any of their own previous excellent efforts at novel and beautiful designs.

An Electric Trust.

The *Record* of last Saturday contained the following article in reference to the Electrical Trust, the formation of which has been talked of for some time past:

"The trustees of the Electrical Trust, which controls all of the electrical lighting companies in this city, held a meeting yesterday and declared a dividend of 75 cents per share. The par value of each share is $100, and the selling price about $40 per share. This is the second dividend that has been declared by the Trust within a little over six months. The first dividend was declared on Oct. 10, and was at the rate of $1 per share. At the meeting of the Trust yesterday the first suggestion of one of the largest Trust deals—outside of the Standard Oil—yet attempted in this country was made. This was nothing less than a proposition to consolidate all the electric lighting companies in the United States in a Trust, so as to control all the electric lighting in the country. Propositions have been made to purchase all the certificates of the Trust in Philadelphia, and there is ample capital behind the scheme to carry it out if a satisfactory deal can be made. It is said that the electric lighting franchises of several of the large cities of the United States have already been absorbed by this new Trust syndicate, and the chances of the absorption of the Philadelphia Trust are excellent. The scheme does not contemplate the purchase of the franchises or companies in the small towns, but only of those in such great centres as New York, Boston, Philadelphia and Chicago. There is reason to believe that the syndicate controls the electric lighting companies in New York and Boston, in which two cities the scheme originated. The propositions made to the Trust in this city are based upon its net earnings for the past six months. None of the members of the Trust were willing to discuss the details of the proposed deal yesterday."

The *Evening Telegraph*, of the same date, has this to say in reference to the matter:

"The report that the Electrical Trust contemplates a consolidation of all the electric lighting companies of the United States is denied by one of the trustees. He said to-day that no meeting of the Trust was held yesterday, and that the proposition has not been discussed at all. No offers for the certificates of the Trust in Philadelphia have been made."

Duty on Carbons.

The Treasury Department has decided that merchandise consisting of small, evenly shaped blocks, prepared chiefly from carbon and partly from manganese and other ingredients, and intended for use in electric batteries, is not exempt from duty as "charcoal," but is dutiable at the rate of 20 per cent. ad valorem under the provision for "carbon blocks, manufactured articles not otherwise provided for." E. W. E.

WESTERN NOTES.

Branch Office of The Electrical World,
44 Lakeside Building, Chicago, April 14, 1888.

The Electrical Supply Co.

The Electrical Supply Company report very large sales of their Diamond batteries. The number sold during last week was larger than in any week since the battery was introduced. One particularly large order for St. Louis helped the figures.

The D. M. Steward Manufacturing Company.

I take the following from the New Orleans *Times-Democrat:* This company is the only one of the kind in the United States and the world. They manufacture all articles in which chalk, slate and soapstone enter. A few of the leading articles are the peerless lava gas tip and superheater, lava insulators for electric light plants, metal workers' crayons, used by all mechanics for marking metals; tailors' crayons, powdered soapstone or French chalk, foundry facings for insuring smooth and fine castings, dustless blackboard crayons and slate pencils. They moved to East End from Cincinnati, to be nearer their raw material, which comes from Georgia, North Carolina and Tennesse. The slate pencils are made from a patent mixture ground and then molded under a 60-ton pressure, and are free from all grit, while in price they are cheaper than the product of the pauper labor of Europe. The building is a two-story brick, 160 by 40, with a four-story tower, and is very handsome and substantial. The engine-room is in an annex and a warehouse 150 feet long completes a plant of $30,000, of which $12,000 stock was taken by Chattanooga. The stock is fully paid and the plant and business is worth every cent of $50,000. The scope of trade is not only in the South, but all over the United States. The officers are D. M. Steward, president; M. L. Chapman, secretary. As a matter of interest it may be noted that they are the only manufacturers in the United States of natural gas burners.

Indianapolis, Ind.

Mr. J. L. Barclay has just returned from a prosperous business trip. He informs me that at Indianapolis, Ind., the people have been agitating the matter of electric light. It seems that the city, owing, I suppose, to its nearness to the natural gas region, wants to be lighted for something like $100,000, a figure which few electric light men may care to touch it at.

The United States Electric Lighting Company.

Mr. C. C. Warren, Manager of the United States Electric Lighting Company, informs me that there has been a marked increase in the business of his company. Last year the business was double that of the previous year. The coming year bids fair to outstrip that of last.

The Central Electric Company.

McKinlock Bros., owing to their rapidly increasing business, have been compelled to seek larger and more commodious quarters. With this end in view, of having more room, they have rented a four-story building with basement at 42 La Salle St. This will give them opportunity to display their goods and increase their stock. They will remove about May 1.

Personal.

Mr. Chas. Desmond, formerly in charge of the Insane Asylum plant at Wauwatosa, Wis., called at the Western Office of The Electrical World this week.

A New Electric Road.

Mr. Chas. L. Pullman, of the Pullman Company, informs me that his company will soon commence the construction of an electric street railway, consisting of five or six miles of double track at Pullman, Ill. The system to be used is not fully decided upon yet, but it is proposed to make it a model road in every particular, and no pains or expense will be spared to render it so.

Sebastian May & Co.,

of Cincinnati, Ohio, have just issued a handsome illustrated catalogue of their lathes, drills, planers and special machinery made by them. They are putting new lathes, planers, etc., in their factory, and hope thereby to be able to catch up on orders. They manufacture a lathe especially adapted for electrical purposes and have a very large and increasing trade among electricians.

C. E. Jones & Bro.,

Cincinnati, Ohio, the well-known makers of electrical models and experimental machinery and dealers in electrical supplies report business very brisk with them. They are just getting out a new special bell outfit which is very simple in construction. It is furnished complete with wire, push button, battery, etc., and can be put up by any one.

The Western Electric Company.

The Western Electric Company have just been awarded the contract for lighting the coming Ohio Valley Centennial Exposition at Cincinnati with 175 arc lights. The company is to be congratulated on its success in carrying off this prize, as the indications are that the electrical exhibit at the exposition this summer will be a very important feature.

Col. S. G. Lynch, broker, 146 La Salle street, furnishes quotations upon telephone stock as follows:

Bell of Mo.	$160@	$165	Iowa Union	$26@	$27
Central Union	47@	48	Michigan	78@	80
Chicago	375@	400	Missouri and Kansas	70@	72
Colorado	19@	21	Rocky Mountain Bell	40@	45
Cumberland	65@	68	Wisconsin	108@	109
Great Southern	35@	40			

E. L. P.

ENGLISH NOTES.

London, April 3, 1888.

The Maxim-Weston Company.

Owing to the Easter holidays, there is comparatively little doing this week in the electrical world. The most important event of the last few days has been the appointment of a committee of shareholders of the Maxim-Weston Electric Light Company, who are to confer with the directors and investigate the affairs of the company. It is thought in some quarters that the investigation, if thorough, must lead to some rather curious disclosures. The company has paid no dividend this year—a fact which has not caused much surprise. What has caused a tonishment, however, is the payment last year of a 7 per cent. dividend, and the year before of 5 per cent. The volume of business upon the basis of which these returns were paid is known to have been singularly small, and even when the company succeeded in securing an important contract, it has usually been at a figure so much lower than its competitors that it is difficult to believe that it could possibly prove remunerative. The non-payment of a dividend this year is, according to Mr. Hugh Watt, M. P., chairman of the company, to be accounted for by the fact that the company had undertaken considerable expenditure with a view of obtaining certain important contracts which afterwards fell through. Nevertheless, according to the balance sheet it appeared that although unable to pay a dividend, a sum of £1,555 had been added to the reserve fund. Mr. Louis Swaby, one of the directors, did not scruple, however, to assert that "the balance sheet was a farce," and he disclaimed all personal responsibility in the matter. So far from having made a profit of £1,500, according to Mr. Swaby, the transactions of the last 12 months had resulted in a dead loss. A long and animated discussion followed, Mr. Hugh Watt courting the fullest investigation, with the result, as I have already mentioned, that a committee of shareholders has been appointed. This is the company, it will be remembered, who recently succeeded in preventing the Anglo-American Brush Corporation from obtaining the contract for lighting the city of London.

Primary Batteries.

Your contemporary, the London *Electrical Review*, appears to have accomplished a good piece of work by nipping in the bud a scheme of the most extraordinary character, in which it was proposed to raise a capital of £600,000 to exploit the now notorious water primary battery. According to a note which appeared the succeeding week in the *Electrician*, M. D'Humy, the inventor of the battery, disclaimed all knowledge of the proposal, but from the statement in the *Electrical Review*, there can be no doubt that a *ballon d'essai* of this nature had been set afloat.

Extraction of Zinc from its Ores.

At the works of the Gulcher Electric Light Company, some extensive experiments have recently been carried out with a new process, due to Mr. Alexander Watt, for the direct extraction of zinc from its ores by electrolysis. The particulars of the method have not yet been made public, but I have reason to believe that this process has an important future before it.

Telephony.

The United Telephone Company have been taking advantage of the Easter holidays to make certain alterations in their switch-room. Although the alterations are not of a very important or extensive character, it is to be hoped that some improvement will result. It is certainly much needed.

Lighting at Chelsea.

A small central lighting station has recently gone into operation at Chelsea, in the south of London. The dynamos are of the Jones type, and were manufactured by the firm of Greenwood & Batley, of Leeds. The distribution is direct, and secondary batteries are employed in the station itself for night working. Very little has yet transpired about this station, which has been carried out by a local company. At Leamington the 16 c. p. incandescent lamps used for street lighting have not proved a success, and they are to be replaced by lamps of double the candle power with improved reflectors; but as only half as many 32 c. p. lamps are to be erected, it is to be feared that the change will not effect any great improvement.

Incandescent Lamp Litigation.

The important action brought by the Edison-Swan Company against the Anglo-American Brush for the infringement of the Swan and Edison incandescent lamp patents is expected to come before the courts about a week hence. I need hardly point out the enormous importance of the interests at stake. For the Edison-Swan Company it is indeed a matter of life and death. The Anglo-American Brush Company are relying upon their Lane-Fox patents, and they have secured a formidable array of legal and technical opinion upon their side. It is, however, well-known that in the English courts the maxim that possession is nine-tenths of the law is held in great repute in patent cases, and the general opinion seems to be that the Edison-Swan patents will be upheld.

Transformer Patents.

With regard to the action between Mr. Ferranti and Messrs. Gaulard & Gibbs, over the transformer patents, the matter is at the present time before the Controller of Patents upon the application of Messrs. Gaulard & Gibbs for leave to amend their specification.

Storage Battery Lighting.

Mr. Crompton continues energetically to push his advocacy of secondary batteries for central station lighting; he will read a paper on the subject at the next meeting of the Society of Telegraph Engineers, and a little later he brings the question before the Society of Arts.

Electro-Motor Pumping Plant.

Not long since you published a full description of a plant supplied by Messrs. Immisch for pumping purposes at St. John's colliery, Normanton. This installation partially replaced a compressed air plant which had been previously in use. The conditions of contract were that the machine should run one month on trial before purchase, but after a fortnight's experience not only did the mine owners conclude the bargain without further delay, but they at the same time gave further orders for plant of a similar description. Some details of the additional plant will probably be interesting, as the conditions are to some extent of a unique character. This new plant is designed to cope with a salt water feeder of 5,100 gallons per hour, at a vertical depth of nearly 900 feet below the surface. It was decided to raise the water at one lift and at a rate of about 7,200 gallons per hour, so that the pumps could stand, if necessary, for 6 hours out of the 24. Since the pressure on the ram faces is about 400 pounds per square inch, specially designed pumps were required, and the electrical plant had to be designed to suit the conditions obtaining. The pumps are differential, with two 6 inch and two 4¼ inch rams. When doing full duty the pumps run at twenty-five revolutions per minute. It was found, by a preliminary trial of a smaller plant, that the load on the rams varied largely at different parts of the stroke. To avoid the heating that would be entailed in an ordinary motor working under a large current with a regular and rapid variation in its intensity, it was necessary to specially design the field and armature. Messrs. Immisch & Co. have successfully met the difficulty, and the plant has now been raising about 125,000 gallons per day for the last month. To give some idea of the electric problem, I may say that the current averages 66 ampères as read by a Siemens dynamometer, but varies at least 10 ampères on either side of the mean current. It is well understood that the heating effect of a varying current is not proportional to the square of the mean current, but is equal to that plus half square of the variable part. This is not all, however; the rapid variations of current increase largely the heating effects due to hysteresis and Foucault currents. The tension on the dynamo terminals is 600 volts, on the motor 575 volts. The actual h. p. in raising the water, at the rate of 120 gallons per minute through 900 feet, is 33 h. p. nearly. The output of the dynamo is 53 h. p. Hence the efficiency between the actual useful work and the output of the dynamo is $\frac{33}{53}$ = 62 per cent. approx

mately. The commercial efficiency or ratio of useful work to belt power in dynamo cannot yet be stated accurately, owing to slip in the dynamo belt. However, taking the efficiency of conversion of the dynamo at the low estimate of 85 per cent. the commercial efficiency is not less than $\frac{33}{0.2 \times 3} = 50$ per cent. approximately.

THE TELEGRAPH.

Medford, Mass.—The fire alarm telegraph in Medford, Mass., is completed and is in service.

Nashville, Tenn.—The Gaynor Electric Company of Louisville is negotiating to put in a fire alarm for the city.

Western Union Taxes.—The Pierce bill, known as the Western Union Tax bill, and which permits the company to present its case to the Court of Claims, is meeting with considerable opposition. The bill, however, came out of committee on April 11, with a favorable report. The amount involved is about $300,000.

New York Messengers.—A bill has been introduced at Albany by Assemblyman J. W. Smith to require messenger boy corporations to keep books which will give full particulars as to the time, name and place every message is delivered. The purpose of the bill is to show where messengers are sent. The bill further provides that messages for pupils in schools must be delivered in the presence of the principal.

Telegraphy in Persia.—Mr. Thomas Stevens, in an article on Persia in the *Commercial Advertiser*, says: "As government offices in Persia are comparatively scarce, and princes decidedly numerous, their posts are not always grand nor their salaries princely, as we are accustomed to use the term. Prince Assabdullah was a young man who had learned telegraphy, and was operator at the little control station of Miana. The Persian government telegraph system consists of one-wire, tumble-down lines, and the offices are little mud-built houses with bee-hive roofs. Prince Assabdullah's daily routine of duty was to squat on a mat inside this hut and from time to time test the line with his instrument. For this prosaic employment he received the munificent salary of $35 a month—25 tomans. On this modest stipend, however, he was able to support a couple of wives and a budding family of princes and princesses, and to keep a farrash. He was a jolly sort of fellow, a regular hail-fellow-well-met, as are a good many of the younger Persian nobles. Although forced to keep up an outward appearance of piety, in deference to the sanctimonious tone of society about him, he showed his contempt for orthodox Shiah practices by taking supper on the quiet with a Feringhi and by consuming a good deal of arrack."

THE TELEPHONE.

Virginia.—A bill has passed the Virginia Legislature incorporating the Scott Telephone and Telegraph Company.

Cleveland, Tenn.—A company has been formed by J. T. Rogers and others to build a telephone line.

Cleveland, O.—The city council of Cleveland, O., has passed an ordinance for burying the electric wires of all kinds within three years at the latest. The Cleveland Telephone Company was granted the privilege for twenty-five years of constructing and maintaining underground conduits.

The Government Suit.—At Washington, on April 9, the United States Supreme Court granted the motion of Solicitor-General Jenks to advance the hearing in the Government suit against the Bell Telephone Company appealed from the decision of Judge Colt at Boston, and named the 2d day of the October term for it. Solicitor-General Jenks is quoted as saying that there can be little doubt of the success of the Government in this case

Telephone Rates.—Last year the N. Y. Assembly appointed a committee, consisting or Messrs. Ainsworth, Hadley, Saxton, Dickey and Conover, to investigate telephone charges. Numerous delays occurred in presenting the report, which was finally submitted about four weeks ago, accompanied by a bill providing for a monthly rental of $6.50 in New York for telephones within a half mile of any central telephone office, and 50 cents additional for every half mile. Other cities are not affected by the bill. Last week the bill was reported for the consideration of the House and committed to the Committee of the Whole.

A Long-Distance Talk.—A dispatch from Bloomington, Ill., of April 15 says: A remarkable feat in long distance telephoning was accomplished to-day. The train dispatcher's office of the Chicago & Alton in this city was connected telephonically with Kansas City, the Western Union wire No. 40 being used. This is a copper wire weighing 210 pounds to the mile, and ordinarily is used for the Wheatstone automatic between Chicago and Kansas City. The new long-distance transmitter of the Bell Telephone Company was used here with six ordinary cells of a Callaud battery, Kansas City using a similar transmitter with four ordinary cells of a Leclanché battery. The conversation between Bloomington and Kansas City was carried on as readily and as perfectly as on a quarter-mile circuit with the ordinary Blake transmitter. Kansas City next extended the circuit to Topeka, Kan., and St. Joseph, Mo., and conversation was carried on as readily as before. The distance is 370 miles to Kansas City, making the longest circuit utilized something over 400 miles. The atmospheric conditions were perfect.

THE ELECTRIC LIGHT.

Frederick, Md.—A Thomson-Houston company is proposed.

Trinidad, Colo., has a new Thomson-Houston plant of 35 arcs.

Bartow, Fla., is to have a plant put in by the Brush Electric Company.

Flatbush, L. I.—The Board of Improvements is increasing the area of electric lighting.

Birmingham, Ala.—An arc and incandescent plant is to be put in by Mr. E. G. Stevens.

Ionia, Mich.—The new Thomson-Houston plant at Ionia has 80 arc lights and 500 incandescents.

Union City, Ind., has bought a Ball engine 12 × 12 to run its 50-light Thomson-Houston dynamo.

Henderson, N. C.—The Henderson Electric Light and Gas Company have secured a site for their plant.

The Alabama Rolling Mills at Birmingham, Ala., propose to put in an arc plant for their works.

Bristol, Tenn.—The Bristol-Goodson Electric Light and Power Company has ordered an additional dynamo.

Mansfield, O.—The Humphries Manufacturing Company have just started their new 150 light Brush incandescent plant.

Nashville, Tenn.—An Edison company has been formed by H. B. Buckner, A. Dahlgren, S. Cowan, J. H. Bruce and others.

Big Stone Gap, Va.—The Big Stone Gap Improvement Company is to build a new hotel and put in an electric light plant.

A Loomis Plant of incandescent lights is being installed at the factory of the N. Ward Company, Spectacle Island, Boston Harbor.

Wheeling, W. Va.—The Board of Gas Trustees has under consideration a proposal to add an electric light plant to cost about $20,000.

Paris, Tex.—The Paris Gas and Electric Light Company is to increase its electric light plant. R. E. Bradford has put in an isolated plant for his hotel.

Atlanta, Ga.—A plan of city work is before the community, including electric light plant and water-works. The total expense will be about $40,000.

Catlettsburg, Ky.—Mr. H. Wellman is interested in a movement to put in an electric light plant, and desires prices on electric and steam apparatus.

Fort Worth, Tex.—The Fort Worth Gas and Electric Light Company have increased their capital stock from $60,000 to $300,000, in order to increase their plant.

Decatur, Ala.—A company is being formed at Decatur for electric lighting by Mr. W. H. Fleming, who put in recently the very successful incandescent plant in the hotel there.

New Albany, Ind.—De Pauw's American Plate Glass Company have made a large addition to their works, and are now lighting up all the new departments with Brush incandescents.

Washington, D. C.—A bill has been introduced in Congress to charter the Potomac Electric Light and Power Company, with Austin Herr, J. W. Thompson, A. T. Britton and others as corporators.

Bridgeport, Conn.—The electric light company at Bridgeport is now running about 350 arcs and 1,000 incandescents. It is adding a new Armington & Sims engine of 90 h. p., and a boiler with Jarvis setting for 120 h. p.

Gas Companies.—There are now operated by gas companies in the United States no fewer than 6,130 arc lights of the Thomson-Houston system alone, to say nothing of the other systems, and the gas companies are briskly entering into the incandescent electric light business.

The "Chicago."—The United States cruiser "Chicago," which is still at the Brooklyn Navy Yard, has been fitted up by the Edison Electric Light Company with 428 incandescent lights. Tney were tested last week for the first time. The officers say that the plant is a great success.

Jackson, O.—The City Council of Jackson received proposals from seventeen high-speed engine builders for a complete steam plant to run their electric light station, and have given the order to the Ball Engine Company, of Erie, Pa. The Edison incandescent and Thomson-Houston arc systems have been adopted.

New London, Conn.—The Thomson-Houston system at New London was put in about Jan. 1, 1888, the electric light company being formerly known as the Oneco Manufacturing Company. There are in use already three 30-light arc machines, a 650-light Westinghouse incandescent machine and Fitchburg steam power.

South Sea versus North Sea.—A Bridgeport correspondent sends us a clipping from an English daily paper of a debate in the House of Lords on electric lighting at the time of the second reading of the bill to amend the wretched old Electric Lighting Act. In the course of the discussion, Lord Herschell said he believed that the use of the electric light was more common in the South Sea Islands than it was in England!

Lacrosse, Wis.—The Edison Company at Lacrosse reports having 2,500 lights on March 1, and will have 3,000 by May. The service includes 100 private houses and 4 churches. The light competes with gas at $2. Five Sprague motors are in use, and more are wanted. The station is in operation 24 hour daily except Sunday, and is in a prosperous condition. Mr. F. A. Copeland is president, Mr. E. E. Bentley secretary and treasurer, and Mr. W. D. Kurz, superintendent.

Salem, O.—The Westinghouse plant at Salem, O., went into operation on April 1. The station was built in two months, and within the same period 550 poles were erected, 27 miles of wire were strung, and 330 lights of 25 c. p. in the streets were turned on to the delight of the inhabitants. The Salem Electric Light and Power Company, who own the plant, are now at work putting up the wires for private lighting, and three stores are already lighted. The officers of the company are M., D. L. and D. W. Davis.

Science Solved the Puzzle.—A Meriden clothing dealer recently offered a spring overcoat to any person solving the "anti-rattle-box" puzzle. This consisted of a short cylindrical wooden box, securely sealed. The point was to shake the box without rattling the contents. On the box was printed: "You can't do it; but it can be done." Those who get hold of the boxes, after shaking them in different ways, cut them open and found the contents to consist of pieces of tin of different shapes. As no method of doing the trick could be thought of, it was generally supposed that the puzzle could not be solved. Charles M. Fairchild, assistant to Superintendent Fitzgerald of the Meriden Electric Light Company, came into possession of one of the boxes. He dissected it, noticed the bits of tin, thought a moment, and then, taking a piece of magnetized iron, replaced the cover on the box and applied the magnet to one end. It was strong enough to attract all the small pieces of tin and hold them fast to the end of the box however violently it was shaken. He got the overcoat.—*Hartford Times.*

APPLICATIONS OF POWER.

Birmingham, Ala.—The Eastlake Land Company is to build a short electric railroad.

District of Columbia.—There are no fewer than twenty-one bills before Congress asking for electric railway franchises in the District of Columbia.

Bristol, Tenn.—An electric railway company has been formed by Messrs. Barker, Reynolds, and others, and it will begin work this summer.

New Rochelle, N. Y., is to have an electric road with five cars, the power to be furnished by the New Rochelle Electric Light Company. The road will be running in June.

Demand for Daft Motors.—It is said that in order to facilitate their operations and meet the demand for motors, the Daft Company are likely to move their Greenville factory to New York.

Richmond, Va.—With regard to the Richmond Sprague road, Mr. S. D. Greene writes to the New York *Herald* as to its success, stating that the number of cars in average daily use is 18, that over 7,000 car trips have been made and that about a quarter of a million passengers have been carried from February 2 to April 8.

Thomson-Houston Roads.—Since securing the Van Depoele system, the Thomson-Houston Company has been very busy on motor work. At Wheeling, W. Va., where the road is at present running seven 15 h. p. motor cars, they are to make an addition of seventeen more of the same capacity. Dayton, Ohio, adds twelve 15 h. p. motor cars. Ansonia, Conn., is to have one 50 h. p. electric locomotive for hauling freight, and will add six new passenger cars equipped with 15 h. p. motors. At Scranton, Pa., they are adding to their original number of seven cars a new lot of eight cars which are thirty feet long, and capable of seating 125 passengers each. In Lima, Ohio, they have just purchased four new cars in addition to the five operated there during the past year. There are now 150 cars in operation every day upon electric railways using the Thomson-Houston system.

PERSONALS.

Mr. W. M. Callender will leave for Europe to-day.

Mr. G. W. La Rue is now associated with the Sprague Electric Railway and Motor Company.

Mr. Daniel Drawbaugh was the subject of an illustrated biographical sketch in the New York *World* of April 15.

Mr. Anthony Reckenzaun left for Europe last Saturday by Cunard steamer. It is hoped that he will return in the Fall.

Dr. E. H. Root, in the *Medical Reporter*, describes the case of a little girl who is so highly magnetic that iron, etc, adheres to her fingers, and who has a sister, nineteen years old, manifesting the same power.

Mr. E. A. Sperry, of Chicago, who has recently been visiting in New York and Boston, returned West last week. He was greatly pleased before leaving to find that Mr. Carl Hering supports by experiment his claim that the winding inside the usual Gramme ring generates no current. It will be remembered that the Sperry dynamo has internal poles specially to utilize the inner winding of the armature.

Mr. Hiram Maxim expects now to do well with his new gun. Special cables say: The Maxim gun is given a great boom in to-day's London *Times* through the fact that a lot of them destined for the Italians in Abysinia were tested yesterday in the presence of Italian experts and numerous English officers. The weapon has been greatly simplified and improved since I described it in your columns two years ago, and the most of the objections of fragility have been obviated. The test was exhaustive and a perfect triumph. An English officer writes to the *Times* to-day describing it as the greatest weapon of destruction yet devised.

MISCELLANEOUS NOTES.

Harper's Ferry, W. Va.—The Harper's Ferry Electric, Heat and Power Company has been formed by F. W. Royce and others.

Washington, D. C.—The Washington & Virginia Underground Conduit and Construction Company have asked for permit to lay underground electric wires.

Helena, Mont.—The Helena Electric Supply Company has been started by Mr. J. K. Williams. It will deal in all kinds of electrical supplies and contract for construction work.

At Edison's Laboratory, Orange, N. J., a few evenings ago, a reception was given to the Contemporary Club, when an interesting address on electricity, especially as employed in Mr. Edison's inventions, was given by Mr. A. E. Kennelly. The guests of the evening were received and entertained by Mr. Edison and Mr. Batchelor, and were delighted with all they heard and saw.

Utilizing Niagara.—The Niagara River Tunnel, Power and Sewer Company are now calling attention to their plan of using some of the power of Niagara by means of its tunnel with which connect conduits in which the water wheels will be placed. The tunnel is to begin a mile above the falls and end below them. It is claimed that though the depth of water in the river will not be lowered 1 per cent., over 100,000 h. p. will be developed for mills and for distribution by electricity for light and power. The estimated cost is put at $3,000,000.

The American Art Journal.—Our esteemed New York contemporary, the *American Art Journal*, the oldest musical weekly in this country, has just closed its twenty-fifth year in peace and prosperity, and celebrates the notable occasion by issuing as its thirteen hundreth number a magnificent *edition de luxe* of nearly 70 pages, printed in colored ink and tastefully wrapped in a cover of white and gold. The issue abounds in original articles, portraits and sketches relative to music and art, and is, altogether, the finest production of the kind that has appeared these many years. Mr. Wm. M. Thoms, the editor, has our hearty congratulations, and best wishes for the next twenty five years.

BUSINESS NOTICES.

The Edison Pressure Recording Gauge seems especially popular with the Edison electrical enterprise. The Edison machine works of Schenectady have now ordered their second instrument from the manufacturer and patentee.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolt cap and set screws, taps, dies, files, twist drills, brass and rubber tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

The Empire State Flint Glass Works, of Brooklyn, will continue to the old and well-known business of F. Thill's Sons & Co. Messrs. Thill and Langan will take charge of the indoor departments, while Mr. Funk will attend to outdoor sales and collections.

The American Electrical Works, of Providence, R. I., call special attention to their patent rubber-covered wire for electric lighting, which has been very successful. In Albany alone over 70 miles for arc lights have been in use for six years and the wire is pronounced in perfect condition to-day by the user.

The D'Humy Water Battery, which has recently received considerable attention in England, is now, it is said, to be introduced here, through the firm of H. R. Pierson & Son, of Albany, N. Y., where a company will be organized.

The Armington & Sims Engine Company, of Providence, R. I., have just issued another of their admirable pamphlets and give in this a view and description of their new special double engine, built for electric lighting, and of which we have already made note. The engine is not only suitable for ordinary plants, but for ship lighting and for general manufacturing.

Frames for Pictures.—Mr. William Levin, 37 Dey street, in addition to manufacturing show-card frames, is also engaged largely in manufacturing fine gold frames, and, in fact, frames of almost every description. He also carries in stock a large line of framed pictures suitable for gifts, private or for business purposes or home decoration. Mr. Levin conducts his business on the basis of strict honesty in all representations and the marking down of all prices to the lowest figure consistent with good work. He has supplied a number of electricians and others.

Hine & Robertson, 45 Cortlandt street, N. Y., are pursuing a novel method of inducing electric light companies to try "Eureka" Packing. To every new customer ordering direct from them 15 pounds or more at regular price, 75 cents per pound, they will send a handsome 8-day calendar clock, 12 in. dial, 24 in. high, or set of brass oilers and tray, 6 pieces, best made. This is an easy way to secure one of these necessary articles and get a packing indorsed by the most prominent electric light plants.

Rubber Belts.—The New York Belting & Packing Company, of New York, have, it is stated, supplied the largest rubber belts ever manufactured in the United States, and their goods, which have a national reputation for superiority, are meeting with great success abroad. At the warehouse of the company, 15 Park Row, N. Y., may be seen immense rubber belts weighing 8 tons, to be sent by Hamburg-American Packet Steamer to Budapest, Hungary.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED APRIL 3, 1888

380,535. Graphophone; Charles S. Tainter, Washington, D. C. Application filed Dec. 2, 1887. Duplicate tablet-holders and duplicate recorders, each having a diaphragm and stylus, are arranged adjacent to air chambers connected with a common speaking tube.

380,409. Semaphore Signal Apparatus; Frederick Stitzel and Chas. Weinedel, Louisville, Ky. Application filed March 18, 1887. The electrical devices comprising of a magnet are used only to lock the signal in either of its set positions.

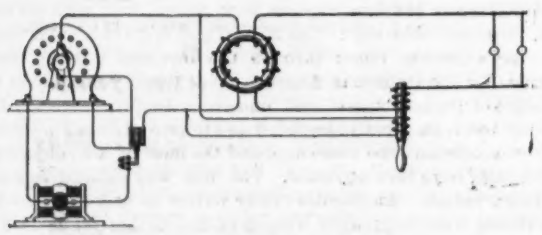
380,655. Municipal Signaling; Morris Martin, Malden, Mass., Assignor to the Municipal Signaling Company, Portsmouth, N. H. Application filed July 31, 1886. The principal feature is the winding and releasing mechanism of the clockwork which operates the transmitter.

PATENTS DATED APRIL 10, 1888.

380,702. Dynamo; Henry B. Slater, Detroit, Mich., Assignor to the Detroit Motor Company, same place. Application filed Dec. 29, 1886. The field magnets are so arranged and the pole pieces so adjusted that substantially the same influence is exerted at different points distributed throughout the whole length of each convolution.

380,752. Telephone Transmitter; Isaiah Henry Farnham, Malden, Assignor to the New England Telphone and Telegraph Company, of Boston, Mass. Application filed Nov. 26, 1887. A casing having a floor of resilient material upon which is supported pulverized carbon. A diaphragm constitutes the opposite wall of the casing and is one of the electrodes, while the other is imbedded in the powdered carbon.

380,757. System of Electrical Distribution; William H. Hart, of Brooklyn, and James Thorn Goodfellow, of Troy, New York, Assignors to William Hampden Johnstone, of Philadelphia, Pa. Application filed March 3, 1887. By this system one or more wires may be taken from the cables at intervals in manholes, or service branches between the manholes,



380,845. SYSTEM OF ELECTRICAL DISTRIBUTION.

and the remainder of the wires may be then carried forward in a cable or cluster to the next point where they are to be divided, and so on continuously until all the wires are utilized.

380,765. Electric Accumulator; John M. Pendleton, New Brighton, N. J. Application filed Sept. 1, 1887. The supporting plate has applied to it the excitant, and then sheets of metal foil are placed in contact therewith and filled with small perforations or punctures. The edges of the punctures become imbedded and corroded in the excitant, and this renders the foil a receptive material. See illustration.

380,766. Electric Cut-Out; Charles G. Perkins and John Tregoning, Hartford, Conn. Application filed July 2, 1887. The main object of the invention is to provide easy and certain means for connecting up electric circuits with interposed safety catches or strips. It consists, broadly, of a block or base of insulating material supporting one or more safety-strips and a second block or base with which the first can be conveniently connected in such a manner as to make a spring-connection between the terminals on the respective bases. See illustration.

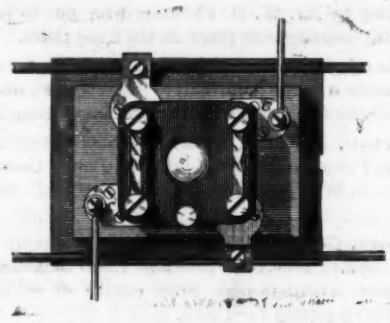
(1) 380,778. (2) 380,779. (3) 380 780. (1) Municipal Telegraph Apparatus; (2) Municipal Telegraph; (3) Telephone and Signaling Circuit; John C. Wilson, Boston, Mass., Assignor of all to the Municipal Signal Company of Portsmouth, N. H. Applications filed respectively June 29, 1886; July 28, 1886, and June 18, 1887. (1) By operating instruments at central station a visual signal is placed in view at all the boxes on the circuit simultaneously. (2) In the same kind of system means are provided for placing in view the visual signal of any particular box on circuit. (3) In an electric circuit one or more automatic signal transmitters and an induction coil, one of the coils of which is included in the said circuit and the other in a secondary circuit, and a receiving instrument in the secondary circuit, combined with a condenser placed in a shunt circuit around each signal transmitter, and with telephones which operate in the circuit, either through the signal transmitters or through the condenser.

380,817. Electrical Governor; Frank E. Prichard, of Cedar Falls, Iowa. Application filed July 27, 1887. A ratchet wheel connected with the controlling valve of the motor is engaged by pawls, and the pawls are controlled by electro-magnetic mechanism. A centrifugal governor is used to commute the current.

380,824. Electrical Speed Indicator; Frederick W. Schlepegrell, Charleston, S. C. Application filed June 21, 1887. When the speed of a piece of machinery becomes abnormal the balls on the governor extend outward, and make electrical contact with points supported in arms, revolving with with the balls. This contact completes an alarm circuit.

380,829. Electrical Hand Cord Tip; Henry J. Swarts, Detroit, Mich., Assignor of one-half to J. W. Dart, same place. Application filed Sept. 3, 1887. The tip consists of two parts, secured together by means of a screw. The parts clamp the end of the cord.

380,842. Apparatus for Examining Ores; John R. Williamson, Seattle, Washington Territory, and Wm. W. Hickies, Oakland, Cal. Application filed March 1, 1887. A

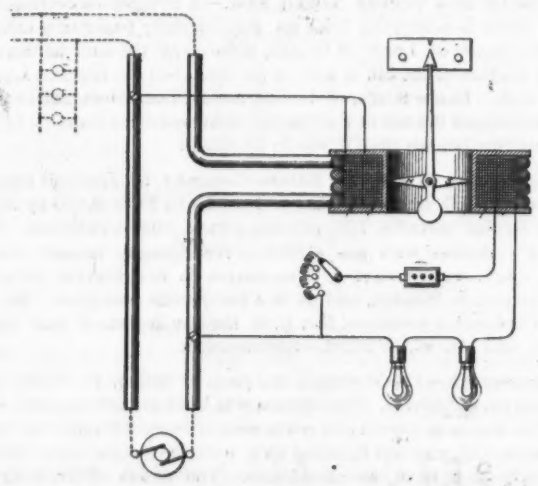


380,766. ELECTRIC CUT-OUT.

battery and telephone are connected by suitable wires with brushes which are placed in contact with the ore. If metal is present the sound of the touch will be heard in the telephone. If no metal is present there is no sound. See page 198.

(1) 380,845. (2) 380,846. Systems of Electrical Translation; Reginald Belfield, Pittsburgh, Pa., Assignor to the Westinghouse Electric Company, same place. Applications filed June 9, 1887. (1) An electric generator and a circuit for the same, an induction coil having its primary coil in the circuit, a circuit including the secondary coil, means for varying the resistance of the secondary circuit, a soft iron core and two coils acting upon the core, one of which coils is included in the secondary circuit and the other of which is in circuit with one primary coil. See illustration. (2) A soft iron core wound with two coils, one of which is in series with the primary and the other in multiple arc with the secondary, is applied to an alternating system.

(1) 380,855. (2) 380,856. Galvanic Batteries; Horatio J. Brewer, New York, N. Y. Applications filed June 3, 1887, and Dec. 31, 1887. (1) The porous cup is provided with a flange which closes the mouth of the jar. The jar has a recess corresponding to a similar recess in the outer jar. The two form a space in which the zinc electrode fits and extends down into the jar and rests upon a shoulder formed by a reduction in



380,944. ELECTRICAL PRESSURE INDICATOR.

the size of the jar near the bottom. (2) Dovetailed brackets of insulating material fit into a groove in the side of the porous cup. The zinc pencil is strapped to the brackets by rubber bands passing around the cup.

380,872. Recording Thermometer; Daniel Draper, Hastings-upon-Hudson, N. Y. Application filed Nov. 10, 1887. An adjustable plate carrying contacts is arranged in front of a chart on which a needle traces a line indicating variations in temperature. In the event of abnormal temperatures contact is made between the needle and contacts, thus completing a circuit which transmits the fact to a desired station.

(1) 380,879, (2) 380,880. (1) Electric Locomotor; (2) Electric Locomotive; Stephen Dudley Field, Yonkers, N. Y. Applications filed respectively Dec. 9, 1887, and Dec. 31, 1887. (1) The motor is mounted upon the axles with intervening springs. Linked connections are made between the wheels on each side and the crank arms upon the shaft of the motor have vertically yielding connections with the links. (2) Modification of (1). For description see THE ELECTRICAL WORLD, Nov. 6, 1886.

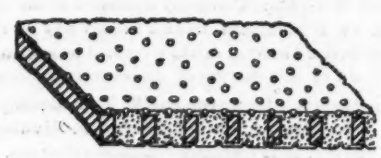
380,905. Electric Telephone; F. Du Pont Marston, Philadelphia, Pa. Application filed April 15, 1887. A gravitating electrode is sustained in a dust-tight guide tube above a horizontal diaphragm.

(1) 380,942. (2) 380,943. (3) 380,944. (4) 380,945. (5) 380,947. (1 and 5) Electric Indicators; (2) Volt Ammeter; (3) Electrical Pressure Indicator; (4) Adjustable Inductive Resistance; Oliver B. Shallenberger, Rochester; Assignor of No. 1 to George Westinghouse, Jr., and Nos. 2, 3, 4 and 5 to the Westinghouse Electric Co., all of Pittsburgh, Pa. Applications filed, respectively, April 23, 1887; Sept. 1, 1887; Sept. 1, 1887; Sept. 1, 1887; and Dec. 9, 1887. (1, 3 and 5) The invention consists, generally, in deriving from the main circuit currents having a potential directly dependent upon the difference of potential at the terminals of the generator and currents upon a second circuit having a potential dependent upon or affected by the loss or drop upon the lines when that loss is enough to cause an appreciable loss upon the work circuit. The currents thus derived are balanced against or caused to oppose each other, and the resultant indicates the difference of potential upon the work circuit. See illustration. (2) An ammeter for alternating or pulsatory currents, consisting of a voltmeter, an electric converter having its primary coil connected in series with the work circuit and its secondary coil connected through the voltmeter. (4) The invention consists in applying to a core of soft iron oppositely-wound coils of insulated wire, which have equal and opposite effects upon the core when the latter is in its normal position, thus producing no inductive resistance. As the core is withdrawn, however, it is gradually removed from the field of one coil, and thus the value of the other coil greatly increases until its full effect is obtained.

380,946. Central Station for Alternate-Current Systems of Electrical Distribution; Oliver B. Shallenberger, of Rochester, and Henry M. Byllesby, of Pittsburgh, Assignors to the Westinghouse Electric Company, of Pittsburgh, Pa. Application filed Jan. 21, 1888. The first claim is as follows: The combination with two sources of electricity and terminal trunk wires for the respective sources of two systems of translating devices, means for placing either system in circuit with either pair of trunk wires, and a switch for connecting said trunk wires in parallel.

380,922. Electrode for Secondary Batteries; Richard Packer, Chester, Pa. Application filed Nov. 7, 1887. The plates are formed in two sheets, with cavities in the face of each for the active material, which register with each other when the sheets are secured together.

380,971. Construction of Stationary and Itinerant Electrical Batteries; James Tarbottom Armstrong, London



380,765. ELECTRIC ACCUMULATOR.

don, England. Application filed Sept. 1, 1887. Patented in England June 30, 1886, No. 8,573. Cisterns containing the charging compound are placed near the battery and connect by means of pipe with the cells. Devices are arranged whereby the cisterns may be raised and lowered and the spent liquid from the cells be discharged into one cistern when it is being lowered and filled from another while it is being raised.

380,989. Secondary Battery; Hiram H. Carpenter, New York, N. Y. Application filed Oct. 8, 1887. A hollow electrode, composed of alloy containing lead and silver, and a body of active material within the same.

381,004. Apparatus for Forming Sheets of Nickel or other Metal by Electrolysis; Moses G. Farmer, Eliot, Maine. Application filed Oct. 17, 1887. A curved plate forming the anode is immersed in the solution, and a cathode ring or hoop mounted on insulated bearings above the anode has a peripheral conducting surface. The current is passed from the former to the latter and a deposit is made on the latter, which is afterwards removed in sheets.

381,048. Contact-Making Device for Electric Railways; Frank Wynne, Westminster, County of Middlesex, England. Application filed June 6, 1887. Patented in England July 15, 1886, No. 9,215; in Germany Jan. 27, 1887, No. 41,326; in France March 9, 1887, No. 182,077; in Belgium Sept. 2, 1887, No. 78,757; and in New South Wales Oct. 4, 1887, No. 235. There are employed a covered channel containing a bare main conductor of electricity and a series of insulated contact surfaces exposed in the said channel and connected electrically to a series of insulated contacts exposed in the road upon which the car or vehicle to be propelled travels.

381,054. Alternate Current System of Electrical Distribution; Henry M. Byllesby, of Pittsburgh, and Oliver B. Schallenberger, of Rochester, Assignors to the Westinghouse Electric Company, of Pittsburgh, Pa. Application filed October 29, 1887. The first claim is as follows: The combination of two driving engines, two electric generators respectively driven thereby, two alternate current generators having their respective field magnet coils normally supplied with currents from the respective generators, and switches for placing the field magnet coils of either alternate current machine in connection with the first-named generators either singly or in multiple arc.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—*can be had from this office for* 25 *cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.*